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THE
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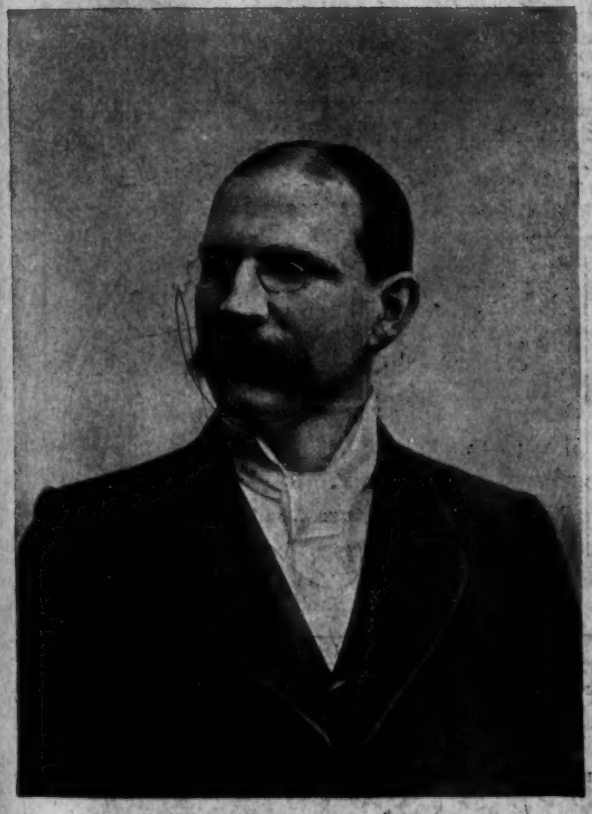

MR. S. M. MURRAY
(Organising Secretary, R.I.S.)

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THE

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A MONTHLY MAGAZINE AND REVIEW

FOR THE SCHOOL-ROOM AND THE STUDY

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JUST INTO SPAIN.

BY J. H. YOXALL.

I.

"Words are the only things that last for ever."—Hazlitt.

"ESCUELA publica de ninas"—come, this was a variation from the "école communale" which I had found in every town hitherto on my route from La Rochelle. "Escuela publica de ninas"—the legend was writ in small, raised black letters over a small door in a small, dirty, whitewashed building; and emblazoned over the inscription, too splendid for so small and dirty a girls' school, were the once proud arms of Spain.

I turned my back on that battered blazonry and gazed across the Bidassoa. Yonder the Pyrenees drooped down, from the triple peaks of the Haya (three thousand feet high and more) to the level of the cliffs beside the Bay of Biscay. Yonder, to my west and right, the sea was all blue, and white, and gold; the blue of it had the hue and sheen of the peacock-plume, the white of the surf was snowy, the flash of the sun on the brief flat lagoons between the successive breakers was burnished gold. But it was not of the seascape I was thinking.

The estuary of the Bidassoa went winding round on my left like a rusty sickle, steel-blue where the tide was not yet run out, rusty with yellow-brown sandbanks where the bed lay bare. Ninety years ago the waters of that frontier river were dyed with British blood; it was there that Wellington crossed from the Peninsula into France; it was yonder, on that farther bank, French soil, that the campaign began which ended, after an interval, at Waterloo. All that ravishing country, southward in France from Bayonne, is full of proud reflections for a Briton. Sad memories, too—we failed at Bayonne. I had seen the famous citadel, built by Vauban in 1679, which still rises over Bayonne and the Adour. "Nunquam polluta" is graven over its portcullis—it has never been entered by a hostile force. The Cimetière des Anglais there owes its name to the total defeat of three British regiments, who stormed the fort in vain. Bayonne was Wellington's one failure after he crossed the river which winds from Pyrenean gorges into the Gulf of Gascony, all white, and gold, and blue. But it was not of Wellington I was thinking; no poet has sung in imperishable words his Gascony feats of arms. I was thinking of a couplet of Walter Scott's. I was come to a spot which for more than a generation of years I had wished to see. I repeated the sonorous lines to myself again, as I stood in the weedy little forecourt of the paltry little "escuela publica de ninas,"—

> "Oh for a blast of that dread horn
> On Fontarabian echoes borne!"

It is true what Hazlitt says: "Words, ideas, feelings, with the progress of time, harden into substances; things, bodies, actions, moulder away, or melt into a sound, into thin air." Wellington, Soult, and the passage of the Bidassoa were much nearer to me in years, but what I was thinking of was the horn of Roland and all the time-solidified magic of the legend enshrined in verse. "Fontarabian echoes"—to Fontarabia I was now come.

I had crossed the Bidassoa quite peacefully, nobody opposing, not even the coastguard nor the custom-house officer, who were asleep. A young French boatman, Eli—"Aylee," as he called himself—had rowed and punted me across from Hendaye; I stepped from the thwarts to the pier, and was suddenly in Spain.

Fuentarabia is a little old town that is built on the most northward sea-washed spur of the Pyrenees, just inside the Spanish border. It is only just inside the frontier, but it is intensely Spain. Fuentarabia pyramids up from its rocky base to the keep of its castle and spire of its church. The town is walled, and you enter it by a most picturesque ruined gateway, *la puerta*, which flaunts the gorgeous arms of Spain, of course. Then you climb the *Calle Mayor* or High Street, and you would know by the look of that street, even if set down in it, while still asleep, by Arabian genii, into what country you were come. For here are the balconies, of carved black wood or twisted iron, under which the guitars were twanged, from which the mantillas hung out, within which the serenaded ladies took the evening air. Here are the deeply overhanging eaves that shadow half the narrow street, no matter where the sun may ride in the sky. And the houses are of stone, and massive and ornate—though now the poor folk dwell in them—and bear proud coats of arms,—arms of "the Count Don Sancho Dias, the Signior of Saldane," and many another hidalgo, for Fuentarabia was once a courtiers' town: here gathered the court of King and Emperor Charles the Fifth, in the heats of summer, to enjoy the northern breeze and seas, just as the court gathers at San Sebastian to-day.

I am no sooner in an ancient place than I hanker to

reconstitute for a moment the dead old life whose traces are around me. It is not enough to feel the pulse and throb of the to-day; the mind demands to know and assimilate the bygone. Standing there, in the shadow of the dateless proud mansions of Fuentarabia, I hankered for "the blast of that dread horn" that might summon back the crowd of knights and dames and fisherfolk who gathered there to hear

"How Roland brave and Oliver,
And every paladin and peer,
On Roncesvalles died."

I found some traces of that old life in the dark church, rich with its faded gildings, and realistic with its figure of "Our Lady of the Seven Sorrows," the seven sword-hilts emerging from her breast, and under the altar the ensanguined tomb.

But amidst the ruins of the palace castle of that great emperor and monk Charles the Fifth I got a shock; for upon a ninth century wall was a nineteenth century advertisement, to this effect:—

FOR SALE
THES ROYALE PALACE AND CASTLE
OF EMPERORE CHARLES V.
APPLI FORE IM-FORMATIONS
TO FERNANDEZ,
FUENNTARABBIA.

It was after observing that sample of Spaniards' English that I went to examine the Fontarabian schools.

There are two of them—the one for girls already described, and the "escuela publica de ninos" just outside the town walls. There are 3,000 inhabitants at Fuentarabia, but I don't think any English voluntary school in a village of 300 people could, during the last fifty years, have shown worse buildings and poorer equipment than these "board" schools at Fuentarabia do; so that again I was moved "to thank the goodness and the grace" that made me a teacher in England rather than in France, or Belgium, or Italy, or Spain. The two schools taken together would not accommodate 150 children on the English scale, though there must be 500 children of school age in Fuentarabia. The schools were empty—the children were on holiday, though they woke no Fontarabian echoes that I could hear; so presently I went down to the old stone pier again, stepping considerately over the coastguard and the custom-house officer, who lay on the pier asleep in a patch of shadow; and then I summoned Eli, to punt me up the estuary to Irun.

From Hendaye, the French frontier town, the railway—"Midi" of France and "Nort" of Spain—crosses to Irun, the first direct Spanish frontier town, by a stone bridge over the river part of the Bidassoa. It is a bridge of three arches. Over the arch nearest France is the stone letter N; over the arch nearest Spain is the stone letter Y—for Napoleon and Ysabella, the emperor and the queen when the bridge was built. I was punted under the Spanish arch, and so came to the custom-house at the railway station of Irun.

The custom-house people let me know at once that I was in Spain. In my bag I had some pairs of socks never worn, and the custom-house people insisted, first in good Spanish, no doubt, and then certainly in bad French, that I was going to sell those socks, not wear them, and that therefore a duty of five pesetas must be paid. Five pesetas is about three shillings, and it looked as though my five pesetas would have to come forth; but I suddenly bethought me of my passport.

My passport is an imposing-looking sheet when unfolded; it bears the resplendent insignia of the United Kingdom, and displays the signature of a great Englishman who (though I did not know it then) lay dying at home. I pointed to that signature. "Sols-burr-ree!" said I. "Paz Sham-burr-len!" the customs-man said, with an ugly grin. "Pas Chamberlain," said I. "Allee, munsieur!" said he; and I carried off my socks untaxed.

Then I boarded a casual, happy-go-lucky train, which was only fifty minutes late in starting, and was jolted off to Pasages. Pasages is Spanish and picturesque. Imagine a mountain tarn; blast an abrupt channel, a few yards wide, to the imminent sea; let in the salt water and the fishing-boats; ring this lagoon with eaved and balconied and rainbow-painted tall houses; stick in a church and a castle, and you will have another Pasages.

I boated across its bay, and presently came to a house which differed only from other blocks of fisherfolks' tenements in this, that written upon its front were the words "Casa de Victor Hugo." It was there that the great poet, novelist, and dramatist dwelt in exile a whole winter through. In the street below I passed a Frenchman, who differed from other Frenchmen in this, that he was Paul Déroulède; for at Pasages this ambitious reactionary bides out his exile too. I crossed the bay again and mounted a train—the same train, I believe, for in Spain trains wait longer at stations than they take to travel between them—and presently I was moving towards San Sebastian, the most fashionable seaside place in Spain. High on the hillside near the town I saw the "Nueva plaza de toros"—it was a bull-fight day—and—

But I must leave to a second article the tale of what I saw at San Sebastian.

BY MANY HANDS.

"Quot homines, tot sententiæ."

A Hint from Russia.

A STRIKING illustration of the possible value of the modern language section of this journal was afforded us only a few days ago. Talking with a Russian who is investigating in England for the benefit of teachers and of an educational journal in Russia, he said, "I have just come from a school in which I have heard a French lesson given by a young lady. Instead of helping the children to learn French, it really threw difficulties in their way." He explained that the method employed was bad, and the pronunciation of the teacher worse, and expressed himself as surprised that among so many practical improvements made of recent years in English education, modern languages should yet be so imperfectly taught. It strikes us that here we have a very pertinent testimony to the value of the section just opened. Pronunciation cannot be learned from books; but the criticism levelled at methods of teaching at least points a direction in which the section can be doubly useful.

Where England Scores.

THE educated Russian has a reputation that is almost fabulous for linguistic ability. We suspect, however, that a good deal of this credit for polyglot gifts is due to the adoption of more practical methods of teaching languages than are yet generally in vogue here. At least that was hinted to us by another expert who is familiar with Russia and her schools. But although we lag behind in our polyglot powers, we can claim an advance in another direction. The same investigator mentioned above, watching with us the lessons and practice of some students in training, was carried away with admiration of the arrangements by which English students were trained in actual class management and application of methods of teaching. It appears that in Russia the training college course, which is four years long, is one of purely theoretical instruction, the colleges neither possessing practising schools nor being in touch with others. From which we infer that we do some things better here, although we may halt in our linguistic attainments.

BRITISH MUSEUM

THE present is a time of "excursions and alarums" concerning education in England. Perhaps for that very reason a book dealing vigorously with new ideas in method is opportune, for where everybody is alert concerning the subject, such a book may have a chance of arresting general attention. Professor Armstrong has collected his sayings and writings of the last few years into a volume, which he appropriately terms *The Teaching of Scientific Method;* for it is the exposition in manifold form of the professor's idea that practical studies of a scientific kind should form the centre and staple of our educational courses. He is best known to primary teachers as the author of the new "omnibus" scheme of science work for the certificate examination. Whatever may be the merits of that exploit, there is no question as to the vigour of his attacks in this book, and we recommend the chapters on the Heuristic Method, on Training in Scientific Method as a Central Motive in Elementary Schools, and on Science Teaching in Schools in Agricultural Districts, to our readers.

A "Boanerges" of Method.

IN this connection there comes into our mind a stimulative little book, too little known in England, which has much in common with the ideas of scientific method and object studies of Professor Armstrong—*The School and Society*, by Professor John Dewey of Chicago. It consists of three lectures—on the school in its social aspects, and the necessity for changes to bring it into line with social changes; on the school in relation to the individual child; and on waste in education—that is, the lack of unity in its aims, the lack of coherence in its studies and methods. They treat the hackneyed subject of education from a new and fresh point of view with a vigour that makes them highly stimulative and refreshing to read. The second lecture, in which Professor Dewey describes some experiments in the University Elementary School, is very striking, and will afford many suggestions to its readers.

A Chicago Book—

ANOTHER American book which would probably interest those who believe in the teaching of history, is Mrs. Sheldon Barnes's *Studies in General History.* Intended really as series of hints to grown-up students of women's colleges in America on the way to study history, it is admirably calculated to supply suggestions to teachers who want to devise new plans of teaching the subject. In the plan in which universal history is broken up into manageable masses, in the hints given of available authorities, but especially in the way in which it is shown how to select material for forming an opinion on a particular period of history, and how to employ the material when selected, it seems to us a veritable mine of suggestions for an ardent teacher. It really assimilates to a "Source Book of History," one of those admirable aids to independent study for which we have to thank the inventive genius of our American cousins.

And One from Boston.

N.U.T. NOTES.

FOR nearly three decades prolonged and vigorous efforts were made to induce all duly-qualified teachers to enrol themselves under the *ægis* of the N.U.T. No matter how obstinate and stiffnecked the non-unionists were, devoted secretaries from Berwick-upon-Tweed to Plymouth, from Pembroke to Lowestoft, gave up their leisure in order to try to induce the outsiders to "come in" with their brethren. And with such glorious results that the Union's membership is now well on the way towards 50,000. Of late years the policy has been rather to ignore the older and wilfully-blind non-members, and to concentrate all energies on the *entrants* to the profession. Already, by the courtesy of the majority of the principals of the training colleges, Union officials and members of the Executive are allowed to acquaint the students with the aims and objects of the N.U.T. On leaving college a very large proportion of the newly-trained teachers join at once, whilst others delay only for a month or two. Many of the large associations, both provincial and metropolitan, hold a yearly reception of the teachers recently appointed in the district; and it has been my good fortune to be present at many of these functions. Though 'twere "invidious to particularise," I am constrained to admit that the Leeds reception is about the best of its kind. The magnificent town-hall was crowded on the occasion of my visit with some seven hundred ladies and gentlemen; and the votaries of Terpsichore had an especially good time of it, as they tripped to the strains of the famous band of the Leeds Rifles. Vocalists—the best the district could supply—added greatly to the evening's enjoyment; whilst light refreshments were furnished, literally *ad lib*, from 9 p.m. until midnight. Brief addresses were delivered by the Lord Mayor, the president of the Leeds Association, the chairman of the Education Committee, and myself, and all were over in less than half an hour. Then Mr. T. G. West, in felicitous terms, asked the acceptance of Mr. C. T. Whitmell, H.M.I., of a beautiful address on his marriage. Votes of thanks concluded the "business" part of the proceedings, and the joys were resumed. Nothing but good can result from a reception so delightfully managed, from first to last, as that of the West Riding capital.

The Leeds Reception.

THE vagaries of an educational "system" which allows, roughly, one-fourth of the men, and one-half of the women, in the teaching profession, to become certificated without a collegiate training, have been exposed almost *ad nauseam*. Many School Boards in the past have indulged their economical propensities by paying the "untrained" class teachers at a lower rate than their college-trained brothers and sisters; and evidence is not wanting that some of our new educational authorities are already prone to pursue the same wicked path. They seem to ignore two vital considerations:—1. That the accommodation for would-be students is lamentably insufficient. 2. That at least three-fourths of the existing accommodation is not at the disposal of the brightest and best of our pupil teachers, but only of such as are prepared to subscribe to the tenets of a particular faith. Till these matters are set right, it is both unjust and cruel to treat non-collegiate teachers as of a lower professional status than those who have been to college. They miss much without such a stigma. They miss the genial *camaraderie* engendered and developed during two years of the most impressionable period of a man's (or woman's) life. They miss the real benefits of close and every-day contact with their fellow-men. They miss the opportunity for cultivation of habits of self-denial, and subordination of their own inclinations for the general good. And in after years they miss the delights of the college reunion. In my day—in the early eighties—York did not take a

A College Reunion.

particularly high place amongst the training colleges of England and Wales. During the past few years, however, under the spirited guidance of the present principal, it has "come with a rush," and is now about the best equipped college in the country. Apart from splendid physical and chemical laboratories, gymnasia, workshops, etc., etc., which have cost altogether about £14,000, the students' material comfort has been well looked after. I rubbed my eyes at the sight of electric light in their bedrooms, numerous bathrooms, a common room, and (ye gods!) a smoking-room! And, better than mere bricks and mortar and the newest and most up-to-date of scientific and educational apparatus, is the possession of a staff of highly-talented tutors and lecturers, imbued with the zeal of the principal himself. *Floreat Ebor!*

* * *

At Newcastle.

'TIS a "far cry" from Reading—the *venue* of last year's Class Teachers' Conference—to Newcastle; yet there was not the slightest falling off in the number of delegates ready and anxious to assist in the bright series of meetings and assemblies. The conversazione was held in a magnificent suite of rooms, and there was a fine attendance of local celebrities, including the Mayor and Mayoress, the Bishop of Newcastle, Mr. George Renwick, M.P., and councillors, School Board members, and pastors galore. The welcome was heartiness itself; but I confess to experiencing a "sort of" feeling that the addresses lacked point, and were a little stodgy. The dictum of the Bishop, that "a boy who left an elementary school *with the desire to know more* had been pretty well educated," is the one sentence that I shall remember. The two sessions devoted to business only were always interesting, and once or twice exciting. After having taken a more or less prominent part in the preceding twelve or thirteen conferences, I felt it a little strange to have to sit still, a sympathetic spectator. The hardy annuals, "Large Schools and Classes," "Inspection *v.* Examination," "Salaries," "Teachers' Register," "Confidential Reports," "C.P.," "Appointment and Dismissal of Teachers," and "Religious Tests," were discussed with the same zest as of yore. The Federation, however, true to its traditions, made history when it unanimously declared for "a national system of education based upon popular control, and freed from religious tests and sectarian influences." I venture to prophesy that ere many years elapse the N.U.T. Conference will take up a similar attitude—the only possible solution of the educational difficulty, in my opinion. The purely domestic business of the N.F.A.T. was unimportant, being confined to (1) enlarging the Federal Committee by two members, and (2) raising the secretary's honorarium to £40 per annum. (It seems almost a pity it wasn't increased to £50 straight away.) The Conference dinner, at which all the representatives were the guests of the Newcastle and Gateshead Class Teachers' Associations, was a brilliant affair. Better post-prandial oratory I never wish to hear; the speeches of Canon Lister, Alderman Newton, Principal Gurney, Councillor Cairns, and Mr. Harry Coward being singularly happy efforts. Mr. Dakers and his efficient and zealous colleagues richly deserved the congratulations showered on them for the excellence and completeness of their arrangements.

* * *

The Conference Souvenir.

FOR the first time in this series of conferences, representatives were presented with a souvenir (of Newcastle and Gateshead). This little sixty-paged brochure was the joint production of Messrs. Wm. A. A. W. Crabb and H. Smith, and well have the editors done their work. Articles on "The Border Land" (Wm. A. A. W. Crabb), "Gateshead" (John W. Boggon), "Durham" (H. Smith), "Educational Facilities of Northumberland and Durham" (A. W. Dakers, B.A.), are included in the work; and in addition, Mr. J. T. Boulter contributes, in chatty fashion, a "History of the National Federation of Assistant Teachers." Views of Newcastle, Gateshead, and Durham, and portraits of local celebrities and the N.F.A.T. officials, add to the interest and attractiveness of the tasteful little work.

* * *

Superannuation.

THE recently issued report of the Board of Education for the year 1902–3 shows how eminently useful is the Superannuation Act of 1898. It will be remembered that the benefits for which the Act makes provision are of three kinds—the Annuity, the Superannuation Allowance, and the Disablement Allowance. The annuity is paid out of the Deferred Annuity Fund. "However few or broken a teacher's contributions may have been, the annuity to which they entitle him will be payable upon his reaching the prescribed age, whether he is then in service or not." The superannuation allowance is granted to any teacher who has fulfilled the conditions prescribed by the Act, upon attaining the age of sixty-five years, or any later age to which his certificate may have been extended. Undoubtedly the most valuable of the benefits of the Act is the disablement allowance, intended to meet the case of a teacher who, before reaching the age of sixty-five, has become permanently incapable, owing to infirmity of mind or body, of being an efficient teacher in a public elementary school (Section 2 (1) (c)). Disablement allowances under this section, amounting to £6,387, 6s. 11d., were awarded during the year to 234 teachers, as shown in the following table.

	Men.	Women.	Total.
Between the ages of 30 and 40....	2	26	28
Between the ages of 40 and 50....	11	48	59
Between the ages of 50 and 60....	28	79	107
Between the ages of 60 and 65....	20	20	40
	61	173	234

In connection with the disablement allowance, a noteworthy official communication has been received by Mr. Yoxall from the Board of Education, to the effect that, by arrangement between the Treasury and the Board of Education, "the production of a medical certificate of incapacity may be dispensed with in the cases of teachers who at the time of application for the renewal of a disablement allowance may be over sixty-five years of age." This will save a good deal of anxiety and annoyance in the future. Seventy-nine men and forty-three women had their certificates extended "on account of special fitness" under Section 1 (2) (*a*). I trust these extensions will become "beautifully less" as years roll on.

* * *

Mr. Coward's Departure.

THE nine-and-twenty gentlemen who had accepted the invitation of Mr. A. Moseley, C.M.G., to visit the United States in the capacity of Educational Commissioners, sailed from Southampton on October 3rd, in the *Philadelphia*. Most of them went down from Waterloo by

the boat train at 10 a.m., and the Executive requested the ex-presidents and treasurer of the Union, as well as Mr. Coward's old colleagues from the west of England electoral district (Messrs. Butland, Prosser, and Winfield), to be present to wish the president "*Bon voyage!*" Mr. Hamilton was, unfortunately, too ill to undertake the pleasing duty, and Mr. Hyden attended in his stead. In addition to the gentlemen already named, Messrs. Gale, Flavell, John, Moorby, and Shawcross were on the platform, and as the train glided out of the station we gave three hearty British cheers—cheers which would ring in Mr. Coward's ears possibly during his nights on the broad Atlantic. The president will hold his own in the best of company, and was last seen in the centre of a snug little party which included Mr. J. Cockburn, late chairman of the Leeds School Board, and the Rev. A. W. Jephson, M.A., member of the London School Board.

A. C.

NOTES FROM THE NORTH.

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December Number:

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Illustrated.

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particularly high place amongst the training colleges of England and Wales. During the past few years, however, under the spirited guidance of the present principal, it has "come with a rush," and is now about the best equipped college in the country. Apart from splendid physical and chemical laboratories, gymnasia, workshops, etc., etc., which have cost altogether about £14,000, the students' material comfort has been well looked after. I rubbed my eyes at the sight of electric light in their bedrooms, numerous bathrooms, a common room, and (ye gods!) a smoking-room! And, better than mere bricks and mortar and the newest and most up-to-date of scientific and educational apparatus, is the possession of a staff of highly-talented tutors and lecturers, imbued with the zeal of the principal himself. *Floreat Ebor!*

* * *

At Newcastle.

'TIS a "far cry" from Reading—the *venue* of last year's Class Teachers' Conference—to Newcastle; yet there was not the slightest falling off in the number of delegates ready and anxious to assist in the bright series of meetings and assemblies. The conversazione was held in a magnificent suite of rooms, and there was a fine attendance of local celebrities, including the Mayor and Mayoress, the Bishop of Newcastle, Mr. George Renwick, M.P., and councillors, School Board members, and pastors galore. The welcome was heartiness itself; but I confess to experiencing a "sort of" feeling that the addresses lacked point, and were a little stodgy. The dictum of the Bishop, that "a boy who left an elementary school *with the desire to know more* had been pretty well educated," is the one sentence that I shall remember. The two sessions devoted to business only were always interesting, and once or twice exciting. After having taken a more or less prominent part in the preceding twelve or thirteen conferences, I felt it a little strange to have to sit still, a sympathetic spectator. The hardy annuals, "Large Schools and Classes," "Inspection *v.* Examination," "Salaries," "Teachers' Register," "Confidential Reports," "C.P.," "Appointment and Dismissal of Teachers," and "Religious Tests," were discussed with the same zest as of yore. The Federation, however, true to its traditions, made history when it unanimously declared for "a national system of education based upon popular control, and freed from religious tests and sectarian influences." I venture to prophesy that ere many years elapse the N.U.T. Conference will take up a similar attitude—the only possible solution of the educational difficulty, in my opinion. The purely domestic business of the N.F.A.T. was unimportant, being confined to (1) enlarging the Federal Committee by two members, and (2) raising the secretary's honorarium to £40 per annum. (It seems almost a pity it wasn't increased to £50 straight away.) The Conference dinner, at which all the representatives were the guests of the Newcastle and Gateshead Class Teachers' Associations, was a brilliant affair. Better post-prandial oratory I never wish to hear; the speeches of Canon Lister, Alderman Newton, Principal Gurney, Councillor Cairns, and Mr. Harry Coward being singularly happy efforts. Mr. Dakers and his efficient and zealous colleagues richly deserved the congratulations showered on them for the excellence and completeness of their arrangements.

* * *

The Conference Souvenir.

FOR the first time in this series of conferences, representatives were presented with a souvenir (of Newcastle and Gateshead). This little sixty-paged brochure was the joint production of Messrs. Wm. A. A. W. Crabb and H. Smith, and well have the editors done their work. Articles on "The Border Land" (Wm. A. A. W. Crabb), "Gateshead" (John W. Boggon), "Durham" (H. Smith), "Educational Facilities of Northumberland and Durham" (A. W. Dakers, B.A.), are included in the work; and in addition, Mr. J. T. Boulter contributes, in chatty fashion, a "History of the National Federation of Assistant Teachers." Views of Newcastle, Gateshead, and Durham, and portraits of local celebrities and the N.F.A.T. officials, add to the interest and attractiveness of the tasteful little work.

* * *

Superannuation.

THE recently issued report of the Board of Education for the year 1902–3 shows how eminently useful is the Superannuation Act of 1898. It will be remembered that the benefits for which the Act makes provision are of three kinds—the Annuity, the Superannuation Allowance, and the Disablement Allowance. The annuity is paid out of the Deferred Annuity Fund. "However few or broken a teacher's contributions may have been, the annuity to which they entitle him will be payable upon his reaching the prescribed age, whether he is then in service or not." The superannuation allowance is granted to any teacher who has fulfilled the conditions prescribed by the Act, upon attaining the age of sixty-five years, or any later age to which his certificate may have been extended. Undoubtedly the most valuable of the benefits of the Act is the disablement allowance, intended to meet the case of a teacher who, before reaching the age of sixty-five, has become permanently incapable, owing to infirmity of mind or body, of being an efficient teacher in a public elementary school (Section 2 (1) (c)). Disablement allowances under this section, amounting to £6,387, 6s. 11d., were awarded during the year to 234 teachers, as shown in the following table.

	Men.	Women.	Total.
Between the ages of 30 and 40....	2	26	28
Between the ages of 40 and 50....	11	48	59
Between the ages of 50 and 60....	28	79	107
Between the ages of 60 and 65....	20	20	40
	61	173	234

In connection with the disablement allowance, a noteworthy official communication has been received by Mr. Yoxall from the Board of Education, to the effect that, by arrangement between the Treasury and the Board of Education, "the production of a medical certificate of incapacity may be dispensed with in the cases of teachers who at the time of application for the renewal of a disablement allowance may be over sixty-five years of age." This will save a good deal of anxiety and annoyance in the future. Seventy-nine men and forty-three women had their certificates extended "on account of special fitness" under Section 1 (2) (*a*). I trust these extensions will become "beautifully less" as years roll on.

* * *

Mr. Coward's Departure.

THE nine-and-twenty gentlemen who had accepted the invitation of Mr. A. Moseley, C.M.G., to visit the United States in the capacity of Educational Commissioners, sailed from Southampton on October 3rd, in the *Philadelphia*. Most of them went down from Waterloo by

the boat train at 10 a.m., and the Executive requested the ex-presidents and treasurer of the Union, as well as Mr. Coward's old colleagues from the west of England electoral district (Messrs. Butland, Prosser, and Winfield), to be present to wish the president "*Bon voyage!*" Mr. Hamilton was, unfortunately, too ill to undertake the pleasing duty, and Mr. Hyden attended in his stead. In addition to the gentlemen already named, Messrs. Gale, Flavell, John, Moorby, and Shawcross were on the platform, and as the train glided out of the station we gave three hearty British cheers—cheers which would ring in Mr. Coward's ears possibly during his nights on the broad Atlantic. The president will hold his own in the best of company, and was last seen in the centre of a snug little party which included Mr. J. Cockburn, late chairman of the Leeds School Board, and the Rev. A. W. Jephson, M.A., member of the London School Board.

A. C.

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PRIZE AND REWARD BOOK NOTICES.

Illustrated.

3. That the administrative area of each local Education Board should be determined solely on educational grounds; but if it should be found necessary to make educational areas coincident with any of the existing Local Government areas, then the "County District" of the Local Government Act, 1889, should be adopted, or the county area, according to the circumstances of each locality.

4. That a committee, consisting of representatives of the various educational interests of the country, should be appointed to act as an advisory council to the Scotch Education Department.

5. That the Central Authority should be located in Edinburgh.

6. That the training of teachers should be directed by the Central Authority along with a board in each university centre, consisting of representatives of the university, the Local Authorities, and the teaching profession.

7. That a superannuation scheme, applicable to both Primary and Secondary teachers in Scotland, should be adopted, the premiums and the pensions being in proportion to salary; and that the Government, the Local Authorities, and the teachers should contribute equal amounts.

HE then proceeded to deal in detail with each of the various points; and with reference to the abolition of the cumulative voting, he said there then remained the possibility of the religious question being raised even in Scotland. The Prime Minister had pointed out that Scottish Education was frankly denominational. While that statement required to be qualified, it was in the main historically accurate. But it was necessary that, in any prospective measure for Presbyterian Scotland, due account should be taken of the evident rights of minorities. If we were to have no religious ruptures, no passive resisters in Scotland, such as have marred the English measure, Voluntary schools—Catholic and Episcopal—must have their independence adequately secured. At the Catholic conference recently held at Dumfries, Lord Herries voiced the sentiments, no doubt, of the whole Catholic body in Scotland when he advocated, towards securing the greater efficiency of Catholic schools, an appeal for additional grants from the public exchequer, and not from the rates. The Institute as yet had not dealt with this matter, but he ventured to think the average opinion of the members was in favour of such a solution.

The Religious Question.

NEXT to the Bill, the topic that had absorbed most of the attention of the Institute was the Scotch Education Department's recent institution of those supplementary courses of instruction for pupils between the ages of twelve and fourteen which have been the occasion of so much School Board criticism and public controversy. When all secondary considerations arising out of the recent discussions were eliminated, the main burden of our opposition to these new provisions was seen to rest on the conviction that, in spite of the Departmental secretary's public but unofficial disclaimers and explanations, the supplementary courses bore on the very face of them the impress of being *specialising courses on a too limited basis of general education*. The Executive's resolution on this matter he also made public. It was: "That while the desire of the Department to provide suitable instruction for pupils between twelve and fourteen years of age is fully recognised, the institution of supplementary courses for such pupils is contrary to the recognised educational principle, that specialised instruction to be really effective must rest on the solid basis of general education. Parents cannot, as a rule, determine the future occupation of children of only twelve years of age: because, firstly, that is determined as much by opportunity as by choice; and, secondly, the inclinations and aptitudes of their children are at that age not fully disclosed. That, further, the adoption of the rural courses in country schools will seriously prejudice the prospects in life of rural pupils, by withholding from them the advantages of that sound general education which they at present possess in common with town children."

The Supplementary Courses.

MR. THOMAS WALLACE, F.G.S., F.S.A. (Scot.), Rector of the High School, Inverness, was proposed from the chair as the new president. With the thanks of the meeting to Mr. Watson, and the election of Mr. James Beattie, M.A., High School, Oban, to the vice-presidentship, the merely formal business was at an end. The election of Mr. Laurence to the secretaryship was, after much discussion, and on the taking of a vote, at first by show of hands and afterwards by card, agreed to.

Election of Officials.

MR. THOMAS WALLACE, F.G.S., F.S.A.

Mr. H. M'Callum, Glasgow, who had been convener of a sub-committee dealing with the duties and salaries of officials, then moved: "That this meeting proceed to the appointment of an official who shall undertake the duties of treasurer and organising secretary—his whole time being devoted to the service of the Institute; that the salary of the said official for the first year be not less than £350, with expenses; and that the Institute forthwith adopt the necessary means to secure that the same official shall undertake the editorship of the *Educational News*." This, in opposition to a motion for delay, was carried by a large majority. Mr. M'Callum then nominated for the new office Mr. S. M. Murray, Sciennes School, Edinburgh, who at once signified his willingness to accept. I have not here given any indication of the nature of the proceedings which led up to this decision

suffice it to say that it was one of the stormiest meetings of the Institute I have ever seen. There was

MR. S. M. MURRAY.

evidently a considerable amount of feeling in certain quarters with regard to the matter of new officials. However, the result perhaps justified the means.

THE Secretary to the Board of Examiners reported that 657 new members had been added during the year to the Institute, so that the total active membership was 6,119. The balance for the year on the ordinary account, the Treasurer reported, was £138, 5s. There was also a balance of £147, 10s. 1d. on the examinations account, so that the total surplus worked out at £285, 15s. 1d. The total funds of the Institute now amount to close on £6,000.

Membership and Finance.

AS on former occasions, the lady members of the Institute took the opportunity of the large gathering of delegates in the Royal High School, to hold in the afternoon a meeting to discuss questions in which they, as women teachers, are peculiarly concerned. The attendance, on account of the prolonged meeting of the Institute, was not so large as could have been wished. The papers given were of a very high order. The most important was that delivered by Mrs. M. C. Adams, L.L.A., Glasgow, on "The Age Clause in the Infant Department." She deprecated the hard-and-fast line of demarcation—namely, seven years of age—between the infant department and the junior school. If children in Scotland were sent to school when they had completed their fifth year, and were kept regularly at school for two years, it might be possible for the seven-year-olds to pass into the junior school. From statistics taken from her own school, Mrs. Adams showed that fully 65 per cent. of the pupils came to school one half year or more later than five years of age. Then, again, a number of the six-year-olds had been kept a year longer from school because of delicate health, and were thus doubly handicapped. Miss Skinner, Dundee, gave a most interesting paper on "What are the Essentials of Education?" It is a pity that the meeting in the Royal High School was so protracted, as there were many lady teachers who would have liked to be present at both meetings. The discussion of questions peculiar to the various sections of the profession is much to be desired, and the breaking up of the annual Congress into sections for this purpose might be a very good way of promoting and increasing the interest of the various members of the Institute.

Ladies' Meeting.

PERHAPS, on account of the introduction of the supplementary courses, there was this year one of the best displays of publishers' exhibits that have ever been held in the Royal High School. Each firm seemed to vie with the others in producing books at once attractive and useful. Nearly fifty firms were represented, and it was no easy task to get out and about in the rooms in which the various exhibits were displayed. The publishers who have been endeavouring to cope with the demands of the new Code are to be congratulated on the work they have accomplished in that direction during the last six months. It would be invidious to single out any firm for special mention. The difficulties of space in connection with the exhibits is every year increasing, and this year one felt these were greatly emphasised. The publishers' exhibition is one of the most useful adjuncts to the annual meeting, and it is a thousand pities that the Institute does not give the publishers more elbow-room. The crowd of teachers in many of the rooms was so great, that it was with the utmost difficulty, I feel sure, that many of them had an opportunity of seeing the latest productions. From the fact that the teachers in Edinburgh have the opportunity of visiting the exhibits during the Friday, there was more room for country teachers during the Saturday.

Publishers' Exhibits.

PART OF EXHIBIT OF MESSRS. T. NELSON AND SONS.

WHILE the joint-committee of the teachers of England and Scotland are still discussing the schemes

of physical instruction to be adopted in the schools, the Scotch Education Department has begun to move. Intimation has been made that Captain C. Mitchell-Innes has been appointed Inspector of Physical Education in connection with the inspection of higher schools and departments in Scotland. He will also inspect the classes in this subject in the Training Colleges, as well as those for the further instruction of teachers conducted under Article 91 (*d*) of the Code. So far, I have not seen any account of the qualifications of Captain Mitchell-Innes, but I question the advisability of appointing an army man for this work. Surely there could have been found a teacher eminently qualified for this work. It is to be hoped that when the Department appoints the Inspector of Elementary Schools, a teacher—one practically acquainted with the art of teaching as well as the subject of physical education—will be appointed. There are many such in the profession, and we trust the Department will give them its most favourable consideration.

Inspector for Physical Instruction.

THE LONG-DISTANCE SCHOOL JOURNEY.

EIGHT DAY EDUCATIONAL TRIPS FOR LONDON BOARD SCHOOL BOYS.

(*Continued.*)

BY G. G. LEWIS.

Tuesday—Madresfield Court Day.

ON each of our trips we have been fortunate in enlisting the sympathy of ladies and gentlemen in the neighbourhood, some of whom have been good enough to welcome the boys to their home. Lord Beauchamp, in particular, has taken much interest in our work, and treated us with the greatest kindness. Apart from the generous hospitality extended to the boys, the advantage to them of visiting one of the "stately homes of England," and meeting a nobleman like Earl Beauchamp, can hardly be estimated. Boys have strange ideas of the aristocracy, and they are agreeably surprised to find the Earl himself conducting the party over the house and through the grounds, giving delightful little botany lessons on the way. Then we lose ourselves in the maze, inspect the model dairy, wander over the farm, see

FINDING MICA SCHIST ON THE MALVERN HILLS. [G. G. Lewis.
(*By permission of the "Royal Magazine."*)

the hounds go by, look with awe from the safe side of the fence on his prize bulls which are turned out for our special benefit; and last, but not least, sit down to a sumptuous luncheon served in the marquee on the lawn.

We walk over the Malvern Hills to catch our train at Colwall, and the boys, for the first time, see the irregular, massive quarries of igneous rock, and are able to contrast them with the horizontal strata of our own London district. A list of specimens to be obtained is given in the guide book, many of which—such as quartz, felspar, hornblende, gneiss, schist, and syenite—are readily secured during the walk.

A fifty minutes' stop at Hereford gives us time to *march* into the city as far as the cathedral, just to say we have been in Hereford.

Wednesday—River Day.

Brake rides are generally beyond our means; but fortunately for us, our host, Mr. Sayce, engages in posting,

(*By permission of "Focus."*) [G. G. Lewis.

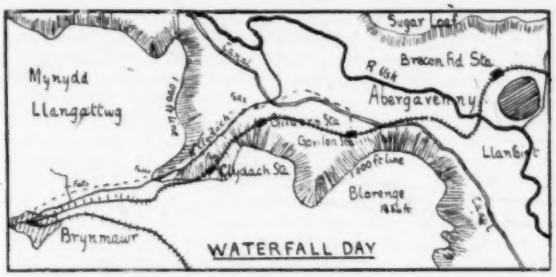
and instead of walking, we are able to ride the seven miles along the lovely Usk. Arrived at Crichhowell, we are anxious to stretch our limbs. The Table Mountain looks inviting, and the pure air being bracing, we decide to push on to Pen-Cerrig-Calch, 2,361 feet—one of the highest points of the Black Mountains. That climb was something to brag about for months after; as one boy put it, he was nearer to heaven than he had ever been before.

A brief chat on the Usk and its rise beyond the distant Brecon Beacons—the way it has carved out the deep valley at our feet—the special interest attaching to the strip of limestone under our feet—and we reluctantly descend to the brakes, which take us over the typically Welsh bridge and along the other side of the Usk, home.

Thursday—Valley Day.

On Monday we saw an infant torrent stream—the Clydach—carving out a deep gorge from the face of the South Wales escarpment. Yesterday showed us the adult Usk, meandering over the broad meadows lying at the bottom of the valley it has been excavating for thousands of years. To-day we are bound for the little Honddu brook, which presents us with the intermediate stage, having cut its way back a dozen miles into the heart of the Black Mountains. Our host again drives us, this time to the ruined Llanthony Abbey, past the quaint village of Cwm Yoy and its very striking landslip. Then we get a four-mile walk up the valley to the modern monastery, where Father Ignatius welcomes us. We go into the little church, and listen enthralled to a thrilling little sermon from this very earnest monk—a sermon none of us will ever forget.

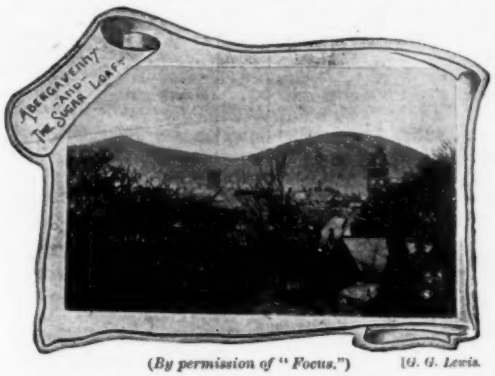
We drive home through the rain, and are soaked through, but we sing our school songs to keep our spirits up. Arriving home, orders are given to change boots, stockings, and clothes; lumps of sugar with spirits of camphor are handed round. We sit down to a hot dinner, cups of coffee specially ordered follow, and the next day not a boy has a suspicion of a cold.



A PAGE FROM THE GUIDE-BOOK.

Friday—Abergavenny Day.

Friday is always left without a programme in case of wet. The first five days are utilised for the four excursions. We are lucky this year—our trips have all been taken, and we have a fine day before us. We ask the boys what they would like. Most of them want another mountain ascent. We visit the remains of the castle in the morning, and set off for the Sugar Loaf in the afternoon. Though only 2,000

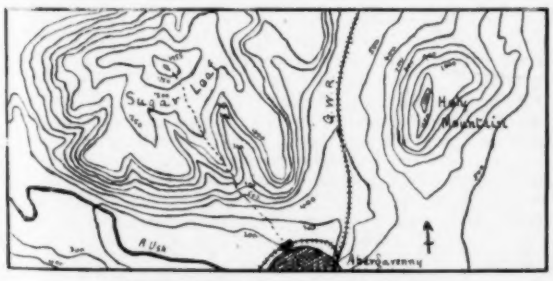


(*By permission of "Focus."*) [*G. G. Lewis.*

feet high, it is really more interesting than Pen-Cerrig-Calch, being an isolated peak commanding extensive views in all directions. The summit is composed of crumbling blocks of Old Red Sandstone, and shows in a striking manner the effect of rain, frost, and wind in pulling mountains to pieces. The slopes are scored by gullies, torn out by the little streams which after rain rush down the side to join the Usk below.

No finer illustration of atmospheric denudation could be wanted. It is cold, too, on top, as can be seen by the boys' faces in the photograph. Two thousand feet causes an appreciable drop in the thermometer.

Here we may digress to say that much stress is laid on the understanding of contoured maps. Several of these are included in the guide, one of which is here shown.

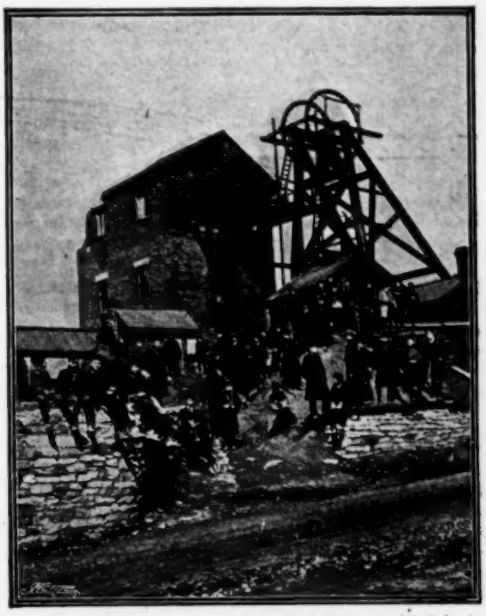


CONTOUR MAP OF THE SUGAR LOAF.

After dinner we reluctantly pack up, ready for the homeward journey to-morrow. The little boys would like to take a day trip home—just to see mother; but all would like to have at least another week.

Saturday—Castle Day.

Early breakfast, "Auld Lang Syne," cheers for "Father and Mother," depart Abergavenny 9.20. We get twenty minutes in Newport, just time to march out on to the bridge and



LONDON BOYS AT A COAL MINE. [*G. G. Lewis.*
(*By permission of the "Royal Magazine."*)

see the muddy banks of the Usk with its coal tips. Arrive Chepstow 11.10 a.m.

Some of the boys were here last year, and they delight to show the others round. There is an interesting "anticlinal" curve to be seen on the banks of the Wye, but Chepstow is a *historical* centre. The castle is just the sort a boy conjures up in his own mind from the story books. There are deep dungeons, thick walls, high towers, winding staircases, heavy doors guarded by a portcullis, steep precipices overlooking the river, and a reputed ghost, actually seen last year by some of the old boys! Truly a fitting finish to an eventful week.

Once again we are in our own "special corridor;" we arrive at Paddington at 8.30 p.m., endure two awful hours on the Underground and L.C.D.R., and find father, mother, brothers, sisters, uncles, and aunts waiting for us at Peckham Rye station.

Conclusion.

As stated in the September article, these outings are made as educational as possible, but the learning part is disguised with all the skill at our disposal. The lads are not compelled to take notes, neither do they get set lessons; but each day they are subjected in turn to a short *viva voce* examination of what they have seen the day before.

Marks are awarded for knowledge obtained; the boys seem to like it, and it acts as a sufficient stimulus to keep their eyes well open. Marks for conduct and cleanliness are also awarded, making a total of 50 per day. At the end of the trip these are totalled (on the last page of the guide), and a report of the boy's conduct and progress is added at the foot. From the difficulty we have had in securing a copy, we know how much these little books are treasured as mementos of the week's holiday.

It is impossible to estimate the ultimate value of these trips to those who participate in them. The extremely cordial feeling brought about between scholar, teacher, and parent is at once apparent. Traits of character become prominent on a holiday which the atmosphere of the classroom has failed to reveal. The boy who has become "chummy" with his teacher in the country will work very

hard indeed to retain his close friendship on the return to work.

Not less important, perhaps, is the influence this week of organised travel will exert on the future holidays of the young tourists. Even those who do not pursue the study of nature after they leave school cannot be altogether blind to its attractions. A trip to the seashore, with its band and Pierrots, will not constitute the be-all and end-all of the holiday. Some sort of plan will be arranged, a map will be an essential, and there will always be some sort of sermon in the stones they see, and a line or two at least in the running brooks.

HOW TO MOUNT BIRDS FOR THE SCHOOL MUSEUM.

SOME time ago there was not that strong yearning after "nature study" that exists at present, and on the suggestion of certain kindly-intentioned people a rule was inserted in the Code that stuffed birds were not to be placed in school museums. This rule was based upon two somewhat extravagant assumptions: first, that cruelty was necessary to get the birds into the museum; and secondly, that when they were there they could not be utilised in inculcating kindness to living animals. Now, teachers and scholars often come across dead birds—pets that have died, or wild birds that get starved in the winter—and perhaps cannot find a taxidermist to stuff and prepare them. So we will just give a little instruction which will enable any one with care to convert a worthless dead bird into a beautiful and valuable object for the school museum.

We will presume that the would-be bird-stuffer has procured a specimen—a starling for preference, as that bird is

common, and possesses a fairly tough skin. Before beginning to skin he should note the compact formation of the plumage, the beautiful curves, and the absence of sharp angles and hollows. Stripped of the feathers, the bird is of a totally different shape. The symmetrical appearance of the live bird is due to the arrangement of the feathers, which, strange to say, are not distributed evenly over the body, but lie in regular lines or "tracts," with intervening spaces of bare skin. Part the breast feathers, and notice the broad band of bare skin. It does not appear to the eye in the live bird, because the feathers from the side tracts join issue and overlap each other, forming an unbroken covering. This example holds good all over the body. In nature these feathers fall naturally into position, but they will need considerable attention before they appear correct in the stuffed specimen. Note the colour of the eyes.

Lay the bird on its back, and opening the wings to their full extent, snap the humeri (B) near the junction with the body. Next put a little dry plaster of Paris in the eyes, working it well under the lids with a blunt needle. Blood or fluid from the stomach is apt to flow up the throat and soil the head feathers, so we must take precautions to prevent this. Clean out the throat and mouth with cotton wool, and insert a plug of the same material, finally closing the mouth and threading a piece cotton through the nostrils.

Skinning.—Requirements: sharp penknife or scalpel, small scissors with long points, forceps, and dry plaster of Paris. Part the breast feathers, and cut from the centre of the breast bone down to the vent, taking care not to penetrate to the entrails. Using the knife, loosen the cut edges on both sides, beginning at the breast and working downwards toward the tail. As the raw, moist flesh appears dust it with plaster. This will dry the spongy surface and prevent the feathers from getting sticky and clotted, as they are apt to do. Never mind the plaster getting on the plumage; it can easily be blown out afterwards. Continue skinning downwards and round towards the back, coaxing off the skin, until the thighs (femurs) appear inside. Snap these through at the joint (see dotted lines at AA in diagram), and sever from the body with the scissors. This operation, usually a difficult one with beginners, is much simplified if the foot is thrust inwards and upwards from the outside, so as to expose more of the "knuckle" for the scissors to operate on. Cut through at the root of the tail, leaving enough of the vertebræ attached to form a foundation for the tail feathers.

Now suspend the bird from a convenient gas-bracket by means of a line and hook, the latter being thrust into the lower part of the body which has been skinned. At the lower part of the back the skin is very tender, and a slight rent will soon enlarge itself, with disastrous results; therefore work carefully at this point, using the finger nails rather than the knife to coax the skin off. When the wing bones (humeri) are reached cut them through, after noting the distance between them across the back. Skin along the neck and over the head until progress is checked by the inner skin of the ears, which appear as two tiny pockets, one on each side of the head. Dip the finger and thumb in plaster, so as to get a good grip, and carefully pinch these out, using the finger nails as levers.

A little further on and we come to the eyes. These are blackish, and apparently out of all proportion to the bird's head; but it must be remembered that only a small part of the eye is visible from the outside. The eyelids are attached to the ball of the eye by a thin transparent membrane (the nictitating membrane), which will be apparent as a white patch, owing to the presence of the plaster which we previously worked into the eye. Cut through the membrane to the plaster with one movement of the knife, and continue severing all round until the outer skin is free from the ball. If this operation is carefully carried out the eyelids remain intact. Scoop out the eyes, and loosen the skin down to the base of the beak.

Finally, sever the neck at the base of the skull, and lay the body on one side for future reference.

Cleaning the Skin.—Scoop out the brains through a hole at the back of the skull, and clean out the flesh from underneath with the forceps, leaving enough muscle attached to form a hinge for the lower jaw. Dust the skull both inside and out with finely-powdered alum, which will both preserve the skin and dry up any flesh that may by chance be left in. If the skin of the neck and head has become dry, moisten it with water before putting on the alum. Pack

the interior of the skull with cut tow (*not* wadding), and fill the eye sockets flush with the skull with moist clay or putty.

The head has now to be returned to its normal position without unduly stretching the skin. Holding the head with the two hands, press on the back of the skull with the thumbs, meanwhile working the skin over the head. If any difficulty is experienced, pull gently on the thread which goes through the nostrils, at the same time coaxing the skin with the fingers. When the head reappears it will probably look very much the worse for wear, the eyelids being white with plaster, and the feathers damp and ruffled. These can usually be put right with a needle and camel-hair brush; but if any of them still prove refractory, insert the blunt point of a needle in the eye or up the neck, and rub the skin gently inside the roots of the feathers.

The wing bones next require attention. Clear the broken humerus of flesh, and using it as a handle, skin down the wing on the inside—the opposite side to which the flight feathers are rooted. These latter go right down to the bone, and must not be disturbed from their foundations. Insert the end of the scissors under the first fleshy muscle that appears, cut it through, and seizing the end with the forceps, pull out at right angles to the direction in which it lies. As it comes out it will open the skin and expose the other muscles, which can be treated in the same way. Put plenty of alum in the now empty "pocket," working it up to the end with a piece of stick, and return the skin to its original position.

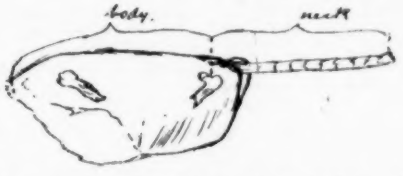
Holding the broken femur, turn the legs inside out as far as the flesh extends. Clear off the muscles, and sever the remains of the femur, leaving the tibia intact, to form the foundation for the artificial thigh to be made later on.

The skin of a bird usually contains a certain amount of fat, which lies chiefly along the roots of the feathers, forming well-defined lines corresponding with the "tracts." This fat must be removed before the preservative is put on, for if left in it will ultimately work up into the feathers and spoil their appearance. Scrape gently with a knife from head to tail.

The oil-glands lying over the root of the tail are full of a fatty matter which the bird uses as a waterproof dressing for its feathers. Hold the tail vertebræ, and skin down until two yellowish-white knobs appear. Carefully cut these out, and dress the whole stump with preservative.

The interior of the skin must now be thoroughly sprinkled with alum, and any dry parts should be touched up with alum and water.

Measuring the Body.—If the bird is to be mounted correctly, the measurements of the artificial body should correspond with those of the natural body. To get the length of



the neck measure from the proximal (body) end of the humerus to the end of the neck, where it joins the skull. The part remaining—the end of the humerus to the severed end of the tail—is the length of the artificial body.

UNDER the title of *Trade and the Empire*, Messrs. G. Philip and Son have just produced a splendid sheet containing, on the same scale, maps of all the different parts of the British Empire, and diagrams representing, graphically as well as by figures, the nature, origin, and amount of our imports, and the nature, destination, and amount of our exports. It should prove of great value both to teachers and to all who are interested in the discussion of fiscal policy.

THE Board of Education have received a communication from the Foreign Office intimating that an International Fine Art and Horticultural Exhibition is to be opened at Düsseldorf on 1st May 1904. A hope is expressed that England will contribute largely to this exhibition.

PRACTICAL SCHOOL METHOD.

GLEANINGS FROM THE REPORT OF THE TEMPORARY INSPECTORS OF IRISH INTERMEDIATE SCHOOLS, 1903.

LAST January the Commissioners of Intermediate Education in Ireland appointed four inspectors to report on the following points in connection with their schools:—(1) Methods of teaching and style of answering, noting particularly (*a*) pronunciation of ancient and modern languages, (*b*) handwriting; (2) Discipline; (3) Qualifications of staff; (4) Character of text-books; (5) Reasonableness of time-table; (6) Hours and means of recreation; (7) Sanitation. The efficiency of the teaching was to be tested by examining the students, and by having the classes taught in presence of the inspectors. As a rule, the teachers took the classes. In many instances, however, they made so little progress with the lesson that the inspector was compelled to take the class to save time. In several schools, we are told, teachers and pupils suffered from nervousness, the state of the latter being apparently a reflection of the state of the former; while in some cases the teachers of a particular class were not forthcoming, though they were not absent from the school. An effort of the imagination is necessary to picture the state of these fugitives from inspection.

There are many points in the report worthy the attention of all teachers, on account of their applicability to schools other than those immediately reported on. The inspectors complain that the scope of the teaching is limited, and the work conducted solely with a view to success in the examinations, admitting that this is not unnatural, since the school grant remains wholly dependent on the written examinations. The low standard of cleanliness in many schools, the defective arrangement of many classrooms with respect to the direction of the light, the absence of special means of ventilation, and the neglect of the use of the windows for ventilating purposes, are all commented upon. The use of slates is condemned on the following grounds:—(1) They are hurtful to the eyesight; (2) tend to spoil the handwriting; (3) are not conducive to neatness of work; (4) are injurious to health. With respect to the arrangement of lessons in the time-table, it is suggested that the lighter subjects should be taken in the afternoon, when the attention of the pupils is more difficult to hold, and the powers of both teachers and pupils must have begun to flag. The teaching, as a whole, showed a great improvement on last year; but much remains to be done in many cases, and the following defects are noticed at some length, with a view to their disappearance in the future:—

1. The use of a text-book in questioning in history, geography, grammar, and literature is not necessary, except for meanings of particular words or expressions. Excessive reference to a book entails loss of time, and allows attention of class to wander.

2. Slowness in putting questions. A teacher should be ready with a fresh question the moment the last one is answered.

3. Verbiage in putting and passing questions. Questions should be asked with the greatest possible brevity. Some teachers read five or six lines, and then ask the meaning of a single word, which is quite intelligible without any context. Again, questions are often prefaced by, "What would you say?" "Now tell me," or other unnecessary verbiage. Also it is common for a teacher to repeat a question when passing it from pupil to pupil.

4. Vague and double questions. Instances: "Well, what about blushful Hippocrene?" "What about adown?" "What do you know about whist?" ("The winds with wonder whist.") Sometimes a word or phrase is quoted and no question asked, so that the pupil does not know what answer is expected—for example, "Heathery couch?" Sometimes two questions are asked at once—for example, "What is meant by Harp of the North? What figure of speech is this?"

5. Discussion of incorrect answers is liable to much abuse, especially when the questions are usually concerned with simple facts.

6. Repetition of correct answers—for example, "Where

are the Trossachs?" *Ans.* In Scotland. *Teacher.* "Yes, the Trossachs are in Scotland. Very good. Very good."

7. Dwelling on pupils who cannot answer. A bad practice, since a pupil who can answer will do so at once, and those who are slow in answering, and need spurring to greater smartness, fail to get that training in readiness which it is a teacher's duty to impart.

8. Altering the question. Perfectly fair questions are made easier as they pass round the form, and sometimes before a single pupil has had time to answer—for example, "How did Queen Mary take the loss of Calais?" A pause. "Was she pleased at it?" A pause. "She was so much distressed that she fell ill and ——?" Then a pupil will complete the sentence by "died."

9. Selecting pupils to answer. Questions should be passed round, and not confined to a few pupils.

10. Acceptance of faulty or slovenly answers. Very common. An exact answer to the question put should be required, otherwise inaccuracy of thought and expression results.

11. Assignment of marks for work done and taking places in lower form lessons are not sufficiently utilised.

12. Articulation and speaking up. Much improved, but still very defective in many schools. Instruction is needed, particularly for the consonants, and some teachers fail badly in their class teaching because of faulty articulation.

In all written work neatness and accuracy should be insisted on, and the written work during the school year should be recorded in suitable books. In this way the master has at all times for ready reference a record of the progress of his pupils, while the inspector is largely helped in forming his estimate of the methods of teaching and of the value of the work done. Such books should be large enough to allow sufficient space for corrections, marginal and otherwise, or much of the teaching done by means of corrections becomes ineffective.

It is refreshing to find that the books prescribed, either for examination or as aids to composition in English, were well received both by teachers and pupils. In some girls' schools, however, *Treasure Island* proved an exception, and we are told that the book was by no means a favourite with the teachers, neither did the girls take any extraordinary interest in it. After all, this need not occasion great surprise; for while *Treasure Island* is unsurpassed as a boy's book, its appeal to girls is much more limited. On the other hand, Lamb's *Tales* proved an ideal book for composition purposes; so in a less degree did *Julius Cæsar* and *Fabiola*. As an examination book *The Lady of the Lake* was very popular; and next to this, Gray's *Elegy* and *Bard* had proved very suitable to the grade for which they were chosen. Shelley, Wordsworth, and Keats were, in some cases, beyond the æsthetical level of both boys and girls, although the more capable teachers made these selected poems the basis of excellent lessons. Complaint is made that the questioning on the set books was often a waste of time, owing to the futility of the questions given. Also that the whole scope of a poem, for instance, was seldom developed systematically by question and answer, as it might have been, but cut-and-dried answers to disconnected questions were often all that could be obtained. Again, in some cases the teaching consisted in making a class learn the whole or a large portion of the set poetry by heart. This, of course, is apt to do more harm than good, unless preceded by a thorough mastery of the sense of the poem. Oral paraphrasing proved of great service in teaching the meaning and testing the comprehension of the language of a poem. Of course this, if pushed to excess, has a tendency to check the growth of a love of poetry.

Compositions on the set books proved superior to essays on general subjects, the latter being generally above the heads of the pupils. Essays of a moral and didactic character are far too common, and consist mainly of notes given by the teacher. Some of the best work done in composition was obtained from boys allowed to choose their own subject and to suggest their own headings.

History is still scrappy, the word "outlines" being confounded with "skeleton." Isolated facts and dates are useless without some attempt to explain cause and effect: for example, It is not enough to ask, "Who introduced Christianity into Ireland? When?" but also, "What beneficial results followed upon the introduction of Christianity into Ireland?" and so on. Condemnation is meted out to text-books consisting of mere notes, and special emphasis is laid on the necessity for preparation on the part of all teachers of this subject, and also on the use of historical maps—a point very frequently neglected.

When we read in the answers to questions in geography that Rome is one of the chief countries of Europe, that Germany is the chief city of France, and Russia the chief city of Germany, we are prepared to agree with the inspectors that geography is not a strong subject. Of mathematical, physical, and commercial geography very little appears to be taught; but in the junior grade the political geography of the British Empire was satisfactorily known, and some good maps were obtained from several schools, although the latter aid to geographical teaching seems to be utilised much less than it might be.

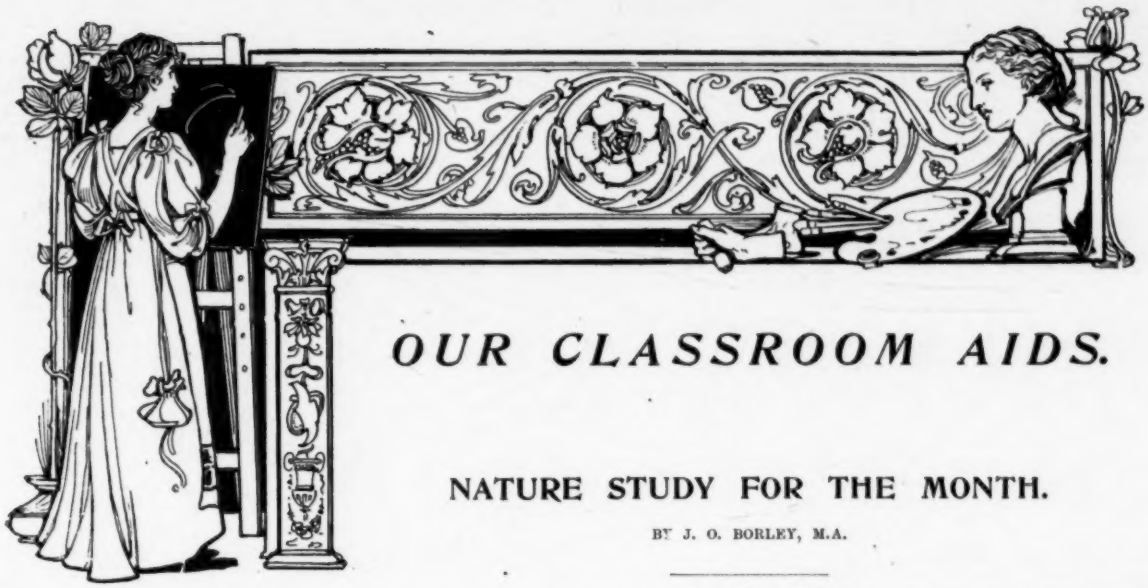
Latin and Greek were taken by some pupils who gave great promise of future success, by many others who were possessed of only average powers of dealing with these subjects, and by some who would be much better engaged in receiving technical rather than intermediate education, considering their probable future career. The general defects mentioned above apply to the teaching of these subjects, and some useful hints on text-books are to be found in the report.

In French and German improvement was shown, particularly in the direction of making these languages living and serviceable. Pronunciation was better, conversational lessons more frequent, composition showed a decided advance, articulation was much improved, and the grammar very well known. This portion of the report certainly shows that very good work in these subjects is being done, and offers very clearly many helpful suggestions well worthy of fuller perusal than is possible in this brief summary.

NOTES AND JOTTINGS.

ANOTHER educational magazine has made its bow—the *Student*, published by the Omega Press, Fishponds, Bristol. We most heartily wish it success in the achievement of its aims, which it thus enunciates: "To emphasise the fact that education is not of any political or religious party; that there is not a great gulf fixed between a master at Harrow and a master in an elementary school at Bow; to break down the distinction between column A and column B of the Teacher's Register; to promote continuity in education; to combine the literary, scientific, and technical interests of the teacher and student; to help to meet those needs which must arise as long as examinations form part of our educational system; and, finally, to bear witness that the ideals of a teacher are higher and withal saner and more practical than any Quest of the San Graal, and that the life of a teacher is more whole and strenuous than that of any light Gawain—these are the aims of the *Student*."

A LARGE number of school teachers took part in the Northern Convention of Choirmasters and Music Teachers, held in September at Newcastle-on-Tyne. Fourteen papers and model lessons were given during the three days' proceedings. The closing day (Saturday) was devoted entirely to educational subjects. The pupil teachers from the centres were present in a body. Mr. Henry J. Finney, London, gave an address on "The Teacher's Voice: How to Preserve It." Mr. R. L. Reid, Glasgow, gave a model lesson to boys and girls from Brighton Avenue School, Gateshead, on "The Application of Tonic Sol-fa to the Staff Notation." Scholars from Windmills Hills Board School had a lesson on "Time Teaching," in both notations, from Mr. W. Harding Bonner, London. Other subjects of special interest to teachers were Mrs. Curwen's paper on "Educational Principles applied to the Teaching of the Pianoforte;" Mr. W. D. Oliver's paper on "The Orchestra in the Higher Elementary School;" Mr. Newton Laycock's specimen lesson to children from Gateshead Higher Grade Intermediate School, touching on "Breathing, Voice and Ear Training, in both Notations;" and Dr. Warriner's address on "Efficiency and Success in Teaching." The Conference was opened by Sir W. H. Stephenson, Mayor of Newcastle-on-Tyne, and the six meetings, which were organised by Mr. Curwen, were largely attended.



OUR CLASSROOM AIDS.

NATURE STUDY FOR THE MONTH.

BY J. O. BORLEY, M.A.

The Rabbit.

IT is difficult to find any animal type readily obtainable and especially appropriate for study in November. We therefore select a common member of a class not hitherto touched on in these articles—the mammals; and the commonest wild mammal in this country is the rabbit. Let us, therefore, suppose ourselves possessed of a rabbit—a condition as necessary to the study of its structure and habits as is the capture of the hare to the culinary operations directed by the cookery books. And preferably a live rabbit should be at hand; if tame, one with as nearly "wild" colouring as possible, together with a wild one (probably dead), and as many different kinds of tame rabbit as the surrounding juvenile population is willing and able to lend for the occasion.

It is best to begin with fundamentals; and as the most familiar things seldom excite remark, however important, it seems hardly wise to allow the first observations to come unguided from a class. Adopt some method of revision of animals previously studied—such as getting rough sketches of them made—and then ask which the rabbit resembles in any way whatever, and what that way is. The resemblance, not very close, is nevertheless definite. Frog, newt, and rabbit alike have four limbs, backbone, and head furnished with eyes fundamentally similar in appearance—all of which characterise the class Vertebrates.

At first sight, however, the differences outweigh the resemblances; and one of the most obvious of differences is the rabbit's possession of fur. With few exceptions (such as the whale), the possession of fur is distinctive of mammals. It is evidently not due to living on land, nor is its absence in the frog merely due to need for gliding swiftly through the water: for serpents and lizards live on land, but have no fur; while seals and water-rats are aquatic, but possess it. To touch the animals with the hand is to answer the question as to what is the use of the fur. The rabbit is warm, the frog much colder. The fur keeps the rabbit warm, just as an eider-down quilt protects its user, by entangling air, an extremely poor conductor of heat; and the covering of fur is essential, because, in some way or other, the high temperature is necessary for the proper conduct of the rabbit's life functions.

In one respect the covering of frog and wild rabbit are, however, alike—both are darker above than below; and this fact has recently received a good deal of attention. It is a fairly commonplace observation that animals are protected from pursuit by being coloured similarly with their surroundings: but it is not by any means invariable that wild rabbits live in sandy places, coloured like their fur. Again, the frog, with its light under-surface, appears to come into the same class of colouring as flat-fish—flounders, etc.; the utility of which an attempt has been made to explain by noting that from *beneath* the white surface would more or less match the dim light from the sky, while from *above* the dark upper surface resembles the bottom. But the frog has no great enemies below the water surface. The case stands thus, therefore—animal colouring is widely different, frequently matching surroundings, but in nearly all animals similar in being lighter below than above.

Thayer, an American naturalist, has supplied the meaning of the fact. He reminds us that any solid body not subject to artificial lights must have a shaded and an illumined side; and at a distance it is to this fact alone that its appearance of solidity is due. To make matters clear, suppose a ball has an illumined side A, and a shaded side B. B is darker than A, and the ball looks solid, seen at any distance. If, however, A be painted darker than B, B will retain its old tint, but A will be darker than before owing to its diminished reflecting power. It is, therefore, possible to hit on a degree of darkening of A which will make the light reaching the eye from A and B equal. At a distance the object seems bereft of solidity, and especially if of about the same colour as surroundings, to be almost invisible.

In nature this process has been carried out again and again; it is most complete in some birds, but really seems to be true of land animals, including the rabbit, also. The principle can be illustrated artificially, with success literally amazing. A pair of Thayer's models are to be seen at the South Kensington Museum, one a dummy bird of uniform tint, the other similar, but darkened above; and the latter from a little distance is no more obvious or substantial than a wisp of cloud. It would certainly prove interesting to try to repeat Thayer's models, though such complete success as his exhibit is improbable. The light should be, as in nature, from above only.

There is one feature of the rabbit no one could claim as made for concealment—namely, the white tail. It shows up distinctly in the brown fur whenever the rabbit is in retreat, and is usually believed to be useful in that very way—the young rabbits, or those farthest removed from the burrows, having for beacon to guide them safely home their predecessors' tails.

So much then for the wild rabbit's fur. On examining the head we at once notice the large ears, the large eyes, and the stiff hairs or whiskers on the snout. The last are no more developed than in many animals, but the others are decidedly more prominent than is usual. The reason is obvious. The creature is defenceless. Its only safety lies in prompt recognition of and flight from an enemy's approach. That prominent eyes, liable to easy injury, and burrowing habits should exist in the same animal is eloquent of the need for shelter and concealment. The ears are protected

to a great extent by their backward droop. Their unusual length marks the night feeder: darkness gives them their importance, since it makes sight less available.

The bluntness or acuteness of the snout is important, since the organs of smell are lodged in the snout. The hare, wild rabbit, and tame rabbit form a series of increasing acuteness, and hence of decreasing size, of nasal organ. This is to be expected when we remember that the first has no shelter but a shallow depression in the ground—its "form" or nest—the second can take refuge in a burrow, and the third has no enemies.

So many other characters of these three animals show similar gradation related with need of rapid flight, quick perception, etc., that it has seemed worth while to tabulate them.

Hare.	Wild Rabbit.	Lop-eared Rabbit.
1. Born with fur and with open eyes.	Born with no fur, and blind for twelve days.	Almost the same as the wild.
2. Ears long.	Ears shorter.	Ears very long owing to selection.
3. Snout blunt.	Snout less blunt.	Snout fairly sharp.
4. Legs long.	Legs shorter.	Legs shorter relatively to the weight by 1¾ inches.
5. Inconspicuous colour.	Inconspicuous colour.	Conspicuous partly owing to selection of finely-coloured animals.
6. Brain ten per cent. greater for same length of skull than wild rabbit.	Taken as standard.	Twelve per cent. less than wild rabbit.

The figures as to brain are founded on those of Darwin. The cunningness of the hare bears them out. A rabbit makes a straight run for its burrow if pursued; a hare has many tricks of evading hounds, such as returning towards them, jumping far aside till they pass, then jumping back and running back on its track to some place of safety.

The Skeleton.

We now pass to the skeleton. There is every reason that this should be studied practically. A skeleton, complete, should be provided by boiling a rabbit's body for a very long time, and removing the shreds of flesh with a pair of forceps, a pair of scissors, and a penknife. Children should bring as many parts of the skeleton as possible for comparison and recognition. The latter forms a very good exercise; and owing to the use of rabbits for food, skeletal parts are easy to obtain.

(*a*) *The backbone.*—This is seen to consist of many parts jointed together, each part being a vertebra. The advantage of a backbone is evidently the strength conferred by it: the need of bending and turning is met by the division of the rigid rod into many pieces. Take these pieces separately and examine them. It is soon seen that alike they have a central bony mass—the centrum; each centrum nearly touching the next, and so forming a rod. All but the tail vertebræ have also an arch of bone above the centrum (through which in life the spinal cord runs secured from injury), and wing-like processes. Examine two from the rib-bearing region, as this region is the most general in form.

Centrum.—This is cylindrical, or nearly so. Note the slight indentations near each end, which seem to mark off end layers or plates. These are important, since they mark the position of the arrangement which allows of vertebrates growing. The bones of young animals are represented by "gristle," or cartilage; and were each to harden into bone as a whole, evidently growth would be at an end. This is provided against by all important bones ossifying in three separate places—the middle and the two ends. These three areas of hardening spread towards each other, but do not, until old age, ever meet. A disc of cartilage is thus left near each end of every vertebra. This disc grows in thickness, and as some, but not all, of the increment is turned into bone by the deposition in it of lime salts, the power of growth is retained. Near the

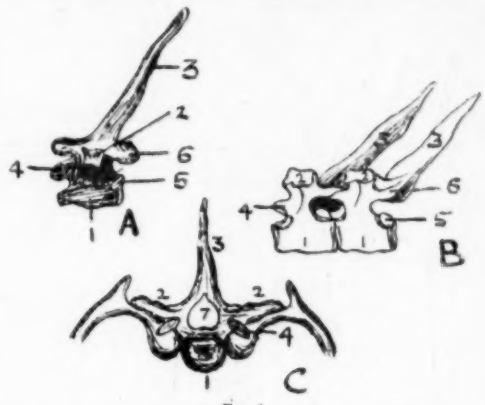


Fig. 1.

A, Rib bearing vertebra. B, Two, fitted together to show (below the dark aperture for nerve) the facet formed by the *two* for the knob at head of rib. C, Showing articulation of rib to vertebra.

1, centrum; 2, transverse or wing-like process; 3, spine above spinal cord; 4, front facet; 6, back facet, for jointing vertebra to vertebra; 5, the facet for reception of the head of rib; 7, spinal canal.

top of each centrum is a small hollowed inclined area. Fit two successive vertebræ together for a moment, and two adjacent hollows are seen to make one larger one. Now take a rib and apply it to the side of the two vertebræ (curving down in natural position) until it appears to fit. It will be found that our double hollow is receiving the rounded end (capitulum) of the rib, which plainly is prepared for its reception. Where is the flat part succeeding the rib's rounded end resting? Not, like the end, between two centra, but under the side wing of one only.

Transverse processes.—The wings, or transverse processes, therefore, form the resting-point for the ribs. But besides this, they form the sides of the protecting arch over the spinal column, and perform another function. There is in life such considerable play between the successive vertebræ that, but for further jointing and interlocking, there might be risk of dislocation. Examine the two together after removing the rib. Then take apart and replace till familiar

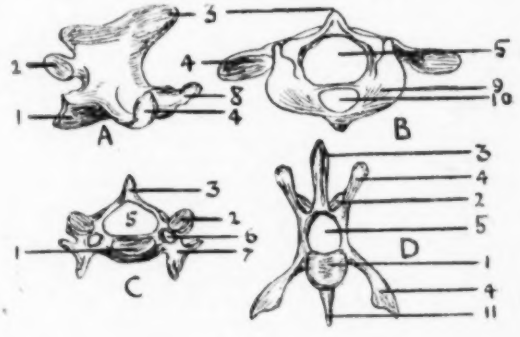


Fig. 2.

A, Axis vertebra. B, Atlas vertebra. C, A neck vertebra. D, A lumbar vertebra.

1, centrum; 2, facets for jointing; 3, spine above canal of spinal cord; 4, transverse process; 5, canal for spinal cord; 6, canal for blood-vessel; 7, rib fused with vertebra; 8, peg which fits loosely in 10, the hole in the atlas; 9, facets, the knobs on skull; 11, a projection peculiar to lumbar vertebra.

with the jointing at the base of the transverse process. One end has a facet facing upwards, the other end has one facing downwards, so that the two fit like the tiles of a house. Which end is front? This, which some find not too easy a question, is answered simply by the *neural spine*. This, which forms the roof of the nerve canal, points up and back from the vertebra. Examination will show that it is

the front facet which looks up and receives the back facet of the preceding vertebræ upon it.

Modifications of the above type.—Behind the ribs the vertebræ increase in size, the transverse process forking, and so giving an upward and a downward flange. Possibly the increased size gives strength. Behind these lumbar vertebræ are two vertebræ, or in an old rabbit more than two, fused together. Two, at least, support the girdle of bone to which the hind limbs are attached, called the pelvis. Strength and stability for the pelvis is no doubt gained by fusion; but the fused vertebræ behind the pelvis may be due to absence of movement. The vertebræ behind those fused dwindle into insignificance.

Going forward from the rib region we approach the head, the seat of the sense organs and the conning-tower of all animals. Accordingly strength gives way to mobility. The head must turn quickly. The neck vertebræ are therefore small, without massive centrum, and destitute of movable ribs. Examine one. Note that beside the nerve canal it has a pair of small open passages—one on each side of the centrum, and just above it. In life a blood-vessel is sheltered in the canals that the successive neck vertebræ form between them. It is interesting to note that the outer sides, floor, and roof of each canal correspond in position with the two processes of the rib and the transverse process respectively. It is supposed to be formed by the remains of small ribs fused with the body of the vertebra.

The foremost pair of vertebræ, the atlas and axis vertebræ, are the stock favourites of elementary physiology books. The skeleton of the rabbit gives a good opportunity of revising it practically. It is a simple matter: the first, or atlas, has two hollows, on which the knobs or condyles of the skull rest, allowing of backward and forward rocking. The hole through the atlas is divided into two, and in the front turns the peg-like process which gives the name to the axis vertebra. Since the atlas has no centrum, and the peg is for a long time unfused to the second vertebra, the peg is thought to be the detached body or centrum of the atlas. The motion of the atlas on the axis allows of rocking the head sideways, and, when combined with turning of the neck, of a side turn of the head also.

(*b*) *The ribs.*—These have already been touched on. Note that many, but not all, join the breast-bone. At the back end of the breast-bone is a cartilaginous extension, which will serve as a good example of cartilage.

(*c*) *The limbs.*—Of these and their attached girdle it should be noted, first, that they resemble both those of man and the frog. Rabbit and man have the hind limb formed of one bone, followed by two, and then by the foot, consisting of some small bones succeeded by long digits (four in rabbit). The set of the limb is some approach to that of the frog: presumably it is a convenient position for hopping, and it certainly saves space in the burrows. The fore limb also resembles our own in essentials. Find the shoulder-blade, arm-bone, and two bones of the forearm: the names of the limb bones are those of our own. One peculiarity of both fore and hind leg is worth noticing: it is, that neither foot nor "hand" can be turned over or aside as can ours. A person rising from his chair by placing both hands on a table before him and pressing has his hands and arms in just the set of a rabbit's. Keeping his elbow still, he finds it easy to turn his hand palm up by revolving the hand round the little finger, but impossible to do so using the thumb as axis. Now any child can feel, in the wrist and arm, bones parallel to thumb and little finger; and since, in the position stated, the thumb can rise but not fall, the bone attached to its side of the hand must be crossed *over* that bone which is in the continuing line of the little finger. The rabbit's hand is so arranged and fixed; it cannot uncross the two arm-bones. So, also, the base of the two leg-bones being fused, the lower end of neither can revolve round the end of the other, and so the foot cannot turn. The arrangement probably imparts strength in burrowing. Do not attempt to isolate bones of hand. Note beautiful ball-and-socket joints at shoulder and top of thigh, and examine the elbow. The chief bone of the forearm projects behind it, and by coming in contact with the back of the bone of the upper arm as the angle of the elbow opens out, prevents that joint being broken.

(*d*) *Skull.*—This is too complicated to treat in detail. Note may be taken of the following features:—1. The large hole at the back and bottom (the foramen magnum), which admits the spinal cord during life. Fill a dry skull with small shot through this hole and empty into a measuring-jar, to show how volume of the brain can be determined. 2. The knobs or condyles, one on each side of (1) mentioned above. 3. The orbits, and the large holes for the optic nerve to enter them. 4. The teeth—the chisel-shaped front teeth, used for stripping bark, nibbling vegetables, etc.; and, after a fairly long gap, the grinders. 5. The large cavity in front of the brain-case, where lodge the sense organs of smell during life, and which, therefore, in a defenceless animal is highly important.

It is impossible here to touch on the anatomy of the soft parts. It is worth remarking that lessons on rabbits would not be complete without reference to the enormous increase that has been ruefully experienced in Australia—a striking contrast to the stationary rabbit population of England, and so indirectly showing the vast destructive effect of natural enemies, such as weasels, etc., in this country. Each pair of rabbits produce about three hundred young, if unmolested, which clearly shows the high rate of mortality that can keep their numbers in Europe fairly stationary.

NATURE KNOWLEDGE.

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LESSONS ON FOODS: VEGETABLE ACIDS.

STARCH, dextrin, maltose, invert sugar, dextrose—that is the logical and physiological order of the foods already considered. It will be convenient to include with them the vegetable acids—tartaric, citric, and the like—since they differ but slightly from the carbohydrates in chemical composition, although their physiological part is quite diverse. Sugar is converted into glucose, artificially or by ferments; glucose, again, is fermented by yeast, forming alcohol; and alcohol is in its turn changed into acetic acid or vinegar by another ferment: so that this carries on the chain from starch to acetic acid.

Examples of fermentation are ready to hand in the alcoholic fermentation, produced by yeast upon sugary substances; in the lactic fermentation, whereby milk sugar is changed into lactic acid, causing the milk to become sour; in the acetic fermentation, which forms vinegar at the expense of the alcohol contained in weak wines, beers, cider, and similar liquids. The common form of indigestion is an example of another kind of fermentation, the butyric, whereby lactic acid in the stomach is further decomposed into butyric acid, with evolution of gases—the so-called "wind in the stomach." In each case we have a plant (for example, yeast) feeding upon some nutrient substance (sugar), and as a result producing waste-products (carbonic acid gas and alcohol), which accumulate to such an extent as to poison the organism which formed them. A child's row of "soldiers," formed by standing clothes-pins on end within striking distance, will illustrate an important feature in fermentation. Tip over the end soldier, and the action is propagated along the whole row, setting in motion a whole chain of events, and producing a cumulative result seemingly out of proportion to the trivial exciting cause.

We begin with acetic acid, a substance formed naturally when cider, beer, or any other light alcoholic liquor turns sour on exposure to air. It is formed in three ways—(1) by the acetic fermentation of sugar, (2) by the oxidation of alcohol, (3) by the destructive distillation of wood—this last product being sometimes called "wood-vinegar," or pyroligneous acid. Pure acetic acid freezes very readily at 1·1° C. or 34° F., and remains solid till about 8·9° C. or 48° F. is reached. It is known to druggists as "glacial acetic acid," and is a popular corrosive for warts and corns. It may be reckoned as pure acetic acid, the strength being about 98–99

per cent. The "acetic acid" of the British Pharmacopeia contains one-third of its weight of pure acid; the "dilute acetic acid" of the British Pharmacopeia is 1 of this in 7 of water—that is, 4¼ per cent. or so of pure acid. The compounds of acetic acid are called acetates.

Pyroligneous acid, or wood-vinegar, is made by distilling wood in closed retorts. Several products are obtained, such as charcoal, tar, wood naphtha or methyl alcohol, and among these is acetic acid, which, however, is not suitable for food, though the refined product is largely used for adulterating and even imitating vinegar.

Vinegar (literally sour wine) is the only food form in which acetic acid occurs. As the name implies, it is formed when wine, beer, or any similar alcoholic liquor turns sour. This change is effected by micro-organisms which collect on the surface and form a skin or scum called "mother of vinegar." The percentage of alcohol should not exceed 10—that is, the strength of a natural wine: and for rapid formation of vinegar, the alcoholic strength should not fall below 3. In order to expose as large a surface as possible to the joint action of the ferment and the air, the wine or beer used is allowed to trickle very slowly over beechwood shavings, which in time get coated with a slime of "mother of vinegar." The best temperature for the action is about 30° C. or 81° F.

Wine vinegar may be white or red, depending on the colour of the original wine. White vinegar is preferred, and varies in strength from 6 to 12 per cent. of pure acetic acid. Since this is made from wine, it contains some "tartar" derived from the original wine.

Cider vinegar is made from cider, is yellowish, and has an odour of apples. It contains no tartaric acid, but malic acid, the acid found in apples, and its strength runs from 3½ to 6 per cent. of pure acid. Perry vinegar and crab vinegar are similar. The latter is made in Wales and the adjacent counties.

Malt vinegar is made from beer without hops, and contains, therefore, a good deal of the extract contained in beer. Its strength of pure acid also varies from 3 to 6 per cent.

Artificial vinegar is often made by mixing a cheap wine with acetic acid, very often obtained from wood, then colouring with caramel, and flavouring with acetic ether. Sometimes this artificial product is simply acetic acid diluted with water down to "proof" strength, which in the British excise is 6 per cent. German vinegar has the same strength; French varies from 8 to 9 per cent.; while American (U.S.A.) runs from 4 to 6 per cent.

Aromatic vinegar is not a food, but a toilet preparation. It is made by distilling verdigris so as to drive off its acetic acid. The aroma of this substance is due to acetone, and very often a small addition is also made of camphor or some essential oil.

Very weak vinegar is liable to putrefactive fermentation, and appears mouldy after a while. The excise authorities therefore permit the addition of 1 gallon of sulphuric acid to 1,000 gallons of vinegar—say 0·2 per cent. This not only increases the sourness of the vinegar, but introduces into the body a most undesirable substance, sulphuric acid.

The only acetates of importance are those of copper and lead, all poisonous. The acetates of copper form blue and green verdigris, while acetate of lead is better known as "sugar of lead." This last is a dangerous substance to have in a house with children, since it resembles loaf sugar in colour, texture, and taste. The best antidote is Epsom salts.

The use of vinegar as a food-stuff is well known. It is specially valuable in preserves and pickles, and when used in moderation it behaves like tartaric and citric acids—that is, it is decomposed in the stomach to form alkaline carbonates, and thus actually helps to keep the blood *alkaline*. This seeming paradox explains the remedial action of these acids in such disorders as gout and rheumatism, and it also gives the clue to their proper position among foods—namely, not so much to build up tissue, or even to raise heat by oxidation, as to preserve the alkalinity of the blood, and supply it with certain chemicals, notably potash and soda, which might otherwise be in defect.

Tartaric acid is found in many fruits, but its manufacture is derived wholly from grapes. The "tartar" which is deposited in wine casks and bottles of old standing is really tartrate of potash and lime, a sort of crude "cream of tartar." The crude tartar obtained by evaporating grape juice is known as argol, red or white, depending on the wine used; and this on being refined yields cream of tartar—practically potassium bitartrate, with a small quantity (2–9 per cent.) of calcium tartrate in the commercial article.

The "tartar" which forms on teeth, especially after a long vegetarian spell, has nothing in common with tartaric acid save the name; it is really carbonate of lime, and is formed on the teeth precisely as "fur" forms on kettles when hard waters are used. It may be removed by using very weak acids, or by the greater use of fresh fruits, which are usually slightly acid.

The chief domestic use of tartaric acid and the tartrates is in the form of baking-powders. All baking processes come ultimately to this, that starchy matters are, by the aid of heat and ferments, partially converted into dextrin and sugars, while at the same time the product is rendered porous by the evolution of gas. In ordinary baking this gas is carbonic acid, released by the action of yeast on starch and sugars; in domestic baking it is also carbonic acid, but obtained by the action of some acid upon a carbonate. In one very interesting process the baking-powder used is ammonium carbonate (smelling-salts!), which on heating releases both ammonia and carbonic acid gases, securing double efficacy in this respect. Lastly, there is the aërated bread process, wherein air under pressure is pumped into the mass of dough, rendering it spongy.

Keeping to the orthodox baking-powder, we find that the carbonate always used is baking-soda (sodium bicarbonate); while the acid used is either tartaric acid itself, or cream of tartar, potassium bitartrate, or lactic acid, as when buttermilk is used. Let us follow out the chemistry of these different methods experimentally.

Take two test-tubes with a little water in each, and dissolve in them some baking-soda and crystals of tartaric acid respectively. Add the tartaric acid to the soda, and observe the bubbles of carbonic acid gas. Now pour the contents in a small basin and gradually expel all water: the result is a white crystalline powder (bitartrate of soda), somewhat like cream of tartar in composition.

Repeat the experiment, using baking-soda and cream of tartar (bitartrate of potash). The same quantity of gas is liberated, and after evaporating a white substance is left as before. This, however, is a double salt (tartrate of soda and potash), familiarly called "Rochelle salt," and used in seidlitz powders and domestic medicine generally as a mild purgative. If buttermilk is used with baking-soda, the resulting solid is lactate of soda. "Tartaline," a substitute for tartaric acid, composed of bisulphate of potash, forms in like manner a double sulphate of potash and soda; an American baking-powder, containing an acid phosphate of potash, leaves in like manner a double phosphate of potash and soda; and so on. Now, when baking-powders are used, all these solid substances are left in the bread, and are eaten by the consumer; whereas in baking with yeast or by aërating, no solid residues occur, the by-products being all gases, or else volatile substances, which are driven off by heat.

Seidlitz powders do not occur in the British Pharmacopeia, but they are sufficiently familiar. The blue paper contains 80 grains of Rochelle salt, potassium sodium tartrate, along with 40 grains of baking-soda; the white paper contains 35 grains of tartaric acid. In "double" powders the acid and carbonate are equal, and the proportion of Rochelle salt is also increased. Gasogene powders are simply baking-soda (blue) and tartaric acid (white), one ounce of each for a five-pint gasogene.

Tartaric acid crystals give off the odour of burnt sugar when heated in a dry tube; they dissolve easily in cold water, 10 in 7, and in boiling water 10 in 5. A small teaspoonful of cream of tartar in hot water taken on rising is a sovereign specific for such blood disorders as chronic rheumatism.

Citric acid closely resembles tartaric. It occurs free in the lemon family, as well as in the gooseberry, cranberry, currant, tamarind, and many other acid fruits, and it is found combined with potash in a very large number of fruits. It is generally made from lemons, limes, and bergamots. The

juice of unripe gooseberries yields about 1 per cent. of pure citric acid, whereas good lemons give 5½ per cent. Citric acid dissolves in water with about the same readiness as tartaric acid. Lime juice and lemon juice are well known as preventives of scurvy. The lemon juice of the Board of Trade standard contains 30 grains of pure citric acid per ounce, or 11 ounces per gallon. "Effervescing citrate of magnesia" is a mixture of citric acid, tartaric acid, and baking-soda, with some loaf sugar, and the optional addition of 3 per cent. or so of Epsom salts, so that it is not a citrate of magnesia at all.

HISTORY DAY BY DAY.

November.

1st. *Battle of Laswaree, 1803.*—The Peishwah of Poona having been driven from his territory by a neighbouring prince, Lord Mornington entered into a compact to restore him. This led to several chiefs combining to resist the English, but after a few minor engagements they were completely crushed by General Lake at Laswaree.

2nd. *Battle of Purwandurrah, 1840.*—In spite of the assurances of the British envoy at Cabul, Dost Mohammed, the Amir of Afghanistan, was suspected by the Government of intriguing with Russia, and was therefore dethroned. He made a grand effort to regain his throne, and won the admiration of every one by the gallant stand he made at Purwandurrah.

The Afghan insurrection, 1841.—The result of the English interference was seen when, on the anniversary of Purwandurrah, a howling, fanatical mob surrounded the house of the British envoy, whom they cruelly murdered. This act of violence was the signal for a general rising.

3rd. *Long Parliament met, 1640.*—Charles's attempt to coerce the Scots had proved a failure, and on every hand he found his kingdom on the verge of revolt. In London, Laud had been mobbed in his palace at Lambeth, and the sittings of the Court of High Commission were broken up; but in spite of all this Charles tried to avoid summoning Parliament, and called a Great Council of the Peers at York. Most of the peers refused to attend, and he was finally compelled to summon a Parliament in order to obtain the money required to pay the indemnity to the Scots.

4th. *Landing of William of Orange, 1688.*—When James heard that an invitation had been sent to William, his obstinacy changed to abject servility. He dissolved the Ecclesiastical Commission; he replaced those magistrates that had been expelled from their offices; the charter was restored to the city of London; and the Fellows of Magdalen who had been expelled were reinstated. All these concessions came too late, and when William landed at Torbay with 13,000 men he was hailed with every demonstration of joy.

5th. *Gunpowder Plot, 1605.*—The hopes of the Catholics had been high when the son of Mary Stuart ascended the throne, and therefore their disappointment was all the more bitter when James enforced the penal laws with even greater severity than before. A knot of desperate men conceived the idea of destroying king and Parliament at a single blow. The plot was revealed by a letter sent to Lord Monteagle by Tresham. Guido Fawkes was arrested in the act of preparing the train, and most of the other conspirators were captured and executed.

Battle of Inkerman, 1854.—The Russians made another grand attack on the allies, but were once more repulsed. The plateau of Inkerman was occupied by the Guards and a few line regiments, and on these fell the task of resisting the entire Russian army until the French could come to their assistance. Inkerman is known as "the soldiers' battle," for the attack was made in a drizzling mist—the soldiers fighting a series of hand-to-hand combats, with scarcely any attempt on the part of the commanders at strategy or scientific warfare.

6th. *Battle of Mahoetaki, 1860.*—The tribes around Auckland began a movement against the colonists, which soon led to a general rising of the Maoris. The quarrel arose in the usual way in a dispute over the land—the colonists, in their eagerness to acquire land, encroaching on the native territory, which was naturally resented. Although the Maoris are an intelligent race, and showed great skill in the art of war, they were unable to hold their own against disciplined troops, and the rising was soon suppressed.

7th. *Dunkirk restored to France, 1662.*—Although the sale of Dunkirk, the one result of Cromwell's victories, has been defended on the ground of expediency, there is no doubt that Charles's only end was to obtain money for his own selfish pleasures.

8th. *Death of Milton, 1674.*—Born in London, 1608; educated at St. Paul's School and Christ's College, Cambridge; appointed Latin Secretary to the Council of State, 1649; and a few years later became blind. *L'Allegro, Il Penseroso,* and *Comus* were written in his early days. His greatest work, *Paradise Lost,* was published in 1667, and *Paradise Regained,* in 1671.

9th. *Buckingham repulsed at La Rochelle, 1627.*—Buckingham saw a means of regaining popularity by supporting the Huguenots in their revolt. The enthusiasm in this country was intense, and a fleet of a hundred vessels sailed under his command. The expedition was extremely impolitic, as Charles had been assisting Richelieu; so the Huguenots, not understanding the change of tactics, refused to co-operate with Buckingham, and after an unsuccessful siege of the Castle of St. Martin, the English troops were obliged to fall back along a narrow causeway exposed to the enemy's fire, two thousand men perishing in this retreat.

10th. *Wilkes expelled from the House of Commons, 1763.*—Although expelled from the House, popular feeling ran high in his favour on account of his opposition to the king, who was himself exceedingly unpopular at that time.

11th. *Orders in Council passed, 1807.*—These famous orders, which were issued by Great Britain in reply to the Berlin Decree, declared all ports of France and her allies to be in a state of blockade, and all vessels good prizes which attempted to enter them unless they had previously touched at a British harbour.

12th. *Massacre of the Danes, 1002.*—Failing to buy off the invaders, Ethelred stooped to an act of the basest treachery, and pitilessly massacred the Danes in the country, one of the victims being Gunhilda, the sister of Sweyn, who had been sent by her brother as a hostage. Sweyn vowed vengeance, and for four years he ravaged the country, "lighting his war beacons as he went."

13th. *Sheriffmuir, 1715.*—After raising his standard (Sept. 6) Mar remained inactive, either through cowardice or incapacity, until his opportunity was gone; for when he did strike a blow, Argyle had gathered his forces to meet him, and although the battle itself was indecisive, Argyle, by his subsequent energetic measures, secured all the advantages of a victory.

14th. *Marriage of Anne Boleyn, 1532.*—Henry decided to bring to an end the divorce question, which had already been debated for six years. He refused to submit to the judgment of any court outside the realm; and as the Pope would not consent to a trial within it, Henry was secretly married to Anne Boleyn.

15th. *The Young Pretender at Carlisle, 1745.*—Skilfully evading an army gathered at Newcastle to oppose him, Charles Edward entered Carlisle without opposition.

16th. *Edward arbitrates between Bruce and Balliol, 1292.*—In demanding the acknowledgment of his suzerainty from the claimants to the Scottish throne, Edward claimed no more than he believed to be his just rights, and in making his award he was actuated by a desire to do justice to the country. The commissioners appointed to report on the various claims were mostly Scotsmen, and the crown was bestowed on Balliol on their advice, and not, as is sometimes stated, because Edward anticipated being able to bend him to his will more easily than Bruce.

17th. *Attack on Lucknow, 1857.*—With a small force of 5,000 men, Sir Colin Campbell attempted the relief of Havelock, who was imprisoned in the city he had so ably assisted (Sept. 25). With the help of the besieged garrison the enemy was dislodged; but the British force was too weak to place the city entirely out of danger, and it was decided to evacuate the city and withdraw to Alumbagh, a few miles to the south.

Suez Canal opened, 1869.

18th. *Wellington's Funeral, 1852.*—"The nation was not ungrateful. It heaped honours on Wellington. On his death it tried to give him such a public funeral as hero never had."

19th. *Vasco da Gama doubled the Cape of Good Hope, 1497.*—The Cape of Good Hope was discovered by Diaz in 1486, but eleven years later Vasco da Gama doubled the cape, landed in what is now Natal, and successfully accomplished the voyage to India.

20th. *Quiberon Bay, 1759.*—The French fleet, which Hawke had been blockading at Brest, broke out during a storm, and took refuge among the rocks and shoals of Quiberon Bay. Having collected his scattered ships, Hawke started in pursuit, and boldly entered the bay in spite of the remonstrance of the pilot. "You have done your duty," said Hawke, "in making this remonstrance; you are now to obey my orders and lay me alongside the French admiral." A complete victory was the result of this bold action.

21st. *Berlin Decree, 1806.*—By this decree Napoleon declared all British ports to be in a state of blockade, and all goods coming from Great Britain or her colonies good prizes of war.

Porto Bello captured, 1739.—Although Walpole was strongly opposed to the declaration of war with Spain, he was forced to yield to popular clamour. The war opened well for England; the English did considerable damage to the Spanish shipping, and Admiral Vernon captured Porto Bello, on the Isthmus of Panama.

22nd. *Grand Remonstrance passed, 1641.*—This was drawn up by Pym, and set forth the work that Parliament had done, and the dangers that beset it. It also demanded the observance of existing laws, security for the administration of justice, and the employment of ministers who enjoyed the confidence of Parliament. After a fierce and bitter debate the Remonstrance was passed by the narrow majority of eleven. "Had it been rejected," said Cromwell, as he left the House, "I would have sold to-morrow all I possess and left England for ever."

23rd. *John Knox died, 1572.*—Throughout the struggle between the unfortunate Mary Queen of Scots and her people, Knox was the leading spirit of the extreme Protestant party, and the bitter opponent of the queen.

24th. *Death of Havelock, 1857.*—Worn out with the hardships he had undergone, Havelock succumbed to an attack of dysentery a few days after his rescue by Sir Colin Campbell. Three days later he was created a baronet by the queen, who was unaware at the time that his glorious career was closed, and that he had passed beyond all earthly rewards.

25th. *Suez Canal shares bought, 1875.*—The Khedive of Egypt held nearly half of the shares in the Suez Canal, but being on the verge of bankruptcy he placed his shares on the market, and to the astonishment of the whole world, Beaconsfield bought them for the British Government for £4,000,000.

26th. *The loss of the "White Ship," 1120.*—Although bitter hatred existed between Henry and his son William, the death of the latter was a terrible blow to Henry, as he saw the kingdom that he had wrested from his brother Robert about to pass to his nephew Stephen. In his extremity he forced the nobles and priests to swear allegiance to Matilda as their queen, and affianced her to the Count of Anjou, as being the husband who could best support her claim.

27th. *Attack on Gibraltar, 1779.*—The combined French and Spanish fleets commenced a blockade of Gibraltar that lasted three years. The British fleet was powerless to render any assistance, but General Elliot held the famous rock fortress against famine and bombardment.

28th. *Battle of Argaum, 1803.*—The victory of Lake at Laswaree was followed by a crushing defeat of the rebel chiefs by Wellesley at Argaum, from which they were unable to recover. They submitted to the victor, and their territories were ceded to England.

29th. *Death of Wolsey, 1530.*—After his fall, Wolsey retired to York, but was arrested for high treason. Worn-out by his enormous labours, and broken by his disgrace, he died at Leicester on his way to London. "Had I but served my God," he said, "as diligently as I have served the king, He would not have given me over in my gray hairs."

30th. *Flight of Clarendon, 1667.*—The public resentment for the humiliating result of the Dutch War fell on Clarendon. Charles, who had long desired to free himself from the control of his minister, dismissed him from the Chancellorship, and the unfortunate Clarendon, fearing to face an impeachment, withdrew to France.

PRACTICAL HELP IN THE ARITHMETIC CLASS.

BY GEORGE COLLAR, B.A., B.SC.,
Joint Author of "A New Arithmetic."

IN spite of the existence of many excellent books on arithmetic, we feel that a few hints on the subject will not be despised by teachers who, feeling the pressure of an overcrowded curriculum, are anxious to get the best results from the time left for this all-important subject.

In order to distribute the help to as many classes as possible, we do not intend to go systematically through the subject rule by rule, but to deal with a point here and a point there as we think help may be most needed. At the same time, this affords us an opportunity of dealing with difficulties our readers like to send as soon as they arrive, instead of holding the question over until its turn comes for treatment under its "rule."

One serious objection to the use of example books in arithmetic is that the teacher himself tends to get out of practice, and instead of being a rapid calculator, as he ought to be, he finds himself making all sorts of "errors in the working," which do not increase the admiration of the class for him. We are not, however, going to recommend that the teacher should work out every example that he sets the class. If this were necessary in teaching the art of arithmetic, truly might we exclaim, *Ars longa, vita brevis est.* We do, however, suggest certain methods of setting the sums which will afford the teacher some practice in calculating, and at the same time enable him to check the work of his class without much trouble.

The following is a method of setting simple addition sums, which requires no more time than if the digits are written down without any system. One row of digits is written down at random, say 34926; the digits of the next row are chosen so that, when added to this row, the sum will be 100000. This is done by writing under each digit (except the units digit) the number required to make it up to 9. Under the units digit we write the number required to make it up to 10; thus, 65074. No matter how many digits there are in the number, a corresponding number can be at once written down which will bring it up to a power of 10. If the example consisted of two such pairs of lines, the sum would be 200000; and if there were three pairs, 300000. But, of course, it is not advisable to set sums which work out to such round numbers, so an odd row of digits is used. The digits of this odd row of digits with the 2 (or 3) prefixed forms the answer, and the teacher sees at a glance whether the pupil's work is correct.

4873	9285	42173
5127	715	57827
2756	3699	82254
3108	8394	17746
6892	6301	57362
		11896
22756	28394	
		269258

In the above examples it will be seen that the position of the key-line may be varied. In the first it is written as the third line, in the second it is written as the fourth, the third and fifth lines in this case being complementary. If the key-line be always written in the same position, there is a chance (though experience shows that it is an extremely small one) of the children discovering a way of obtaining the answer without going through the work of addition. Should the teacher have any suspicion that this is the case, an alteration in the position of the key-line shows the fact up at

once. The third example is absolutely safe, and consists of two pairs of lines each amounting to 100000, and two lines whose sum gives the answer when preceded by 2. In setting an addition sum containing an even number of lines, any digits which are rapidly added together may be used to form this key-pair; but in our example we have chosen the digits in order to illustrate another principle which is of great value in helping the teacher to check the results at a glance. As there are no more than ten digits in use (including 0), if these always came in a fixed order in the answers, the teacher could see whether the results were correct by noting the order of the digits. It is possible to arrange the digits in an order which is quite arbitrary—for example, 2984307651; but such a series is not easily remembered. If, however, we choose an order in which each digit is obtained by adding a common number to the one in front of it, there is no tax on the memory when once we know the common number. In choosing the common number we must reject the even numbers, since they would only bring five in the series, while 0 would bring one, and 5 would bring two in the cycle. If we select 1 or 9, we should have the digits in an order that could not escape the notice of the children. Hence 3 or 7 are the most convenient: if we start with any digit and add 3 (or 7), we shall run through the whole cycle of ten digits—for example, 1, 4, 7, (1) 0, 3, 6, 9, (1) 2, 5, 8. With very little trouble the teacher can arrange his examples so that the results consist of the digits in the above order, and the relation between the digits is not discoverable by the children. By the use of complementary addition, of which we shall speak in our next paper, this is very easily done by the teacher.

We have so far confined our attention to the teaching of simple addition, but the principle is easily adapted to the setting of compound addition sums. Any sum of money may be written down at random for the first line—for example, £57, 8s. 2¼d. Under the farthings we write another number, which, with the one above, will make a penny; under the pence we write a number which, with the 2 above *and the 1 carried*, will make a shilling; under the shillings we write a number which, with the 8 above *and the 1 carried*, will make a pound; and under the pounds we write a number which, with the 57 above *and the 1 carried*, will make 100. Thus:

£	s.	d.
57	8	2¼
42	11	9¾

From the statement above we see that all that is needed is to write in the pounds column the complement of each digit on 9 (that is, $5 + 4 = 9$; $7 + 2 = 9$), in the shillings column the complement on 19, in the pence column the complement on 11, and in the farthings the complement on a penny. Of course, if there were no farthings, we should have to make the number of pence in the two lines come to 12; and if there were neither pence nor farthings, the number of shillings would have to come to 20.

We will now deal with some common types of problems, and we strongly advocate the teaching of problems by means of typical examples; and after the method of dealing with the question has been explained, there is no plan for driving the teaching home, and making sure that the children have grasped the principles, equal to the plan of setting the pupils to *construct* problems as well as to solve them. The plan has a marked effect in training children's intelligence.

We will first deal with problems on unequal division. These may be arranged in two classes: (*a*) those in which one share is a multiple of the others, and (*b*) those in which one share is the sum or difference of a given quantity and one of the other shares.

(*a*) *Typical example.*—Divide £17, 8s. 4d. into four parts such that the first may be twice as great as each of the others.

Here the children must be taught that we really have to divide the sum of money into *five* parts, and take two of these to form the first share.

	£	s.	d.
5	17	8	4
	3	9	8

Hence the first share will be twice £3, 9s. 8d. (that is, £6, 19s. 4d.), and each of the others will be £3, 9s. 8d.

Examples.

1. Divide £23, 16s. 8d. into four parts such that the first may be twice as great as each of the others.

2. Divide £29, 9s. 2d. among five people so that the first may have three times as much as each of the others.

3. Six boxes, of which one weighs twice as much as each of the others, have a united weight of 1 ton 7 lbs. Find the weight of each.

4. Divide £732, 9s. 2d. among seven people so that the share of the first may be three times and the share of the second twice as great as that of each of the others.

There is really no reason why "proportional division" should not be taught at this stage. It is a very easy step for pupils who have mastered the preceding to understand how to divide a quantity into two parts such that one is three-quarters of the other. For since 3 is three-quarters of 4, and 3 and 4 make 7, the quantity must be divided into 7 parts, and 3 parts put into one share and 4 parts into the other.

(*b*) *Typical example.*—Divide £15, 14s. 8d. among four men, giving one of them 8s. 2d. more than to each of the others.

Show the children that if the first man had received 8s. 2d. less than he was entitled to, the four men would have received equal amounts; but at the same time the total would not have been £15, 14s. 8d., but 8s. 2d. less than this. £15, 14s. 8d. − 8s. 2d. = £15, 6s. 6d., which is four times each of the smaller shares. Therefore each of the smaller shares was £15, 6s. 6d. ÷ 4 (that is, £3, 16s. 7½d.), while the larger was this latter amount increased by 8s. 2d.

Children can now construct problems of this type by taking any sum of money and multiplying by the number of parts into which they wish their total to be divided, and then adding on the excess. If they are allowed to build up a few problems in this way, they will never experience any difficulty when called upon to solve them.

As a little variety, questions may be given in which one amount is *less* than the others by a given amount. In this case the given amount must be *added* to the total in order to make the shares equal in value.

5. Divide £15, 1s. 8d. among four people such that the first may have 4s. 10d. less than each of the others.

6. Divide £10, 5s. 8d. among eleven men and a boy so that the boy may receive 3s. 4d. less than each of the men.

OUR ILLUSTRATED GEOGRAPHICAL NOTEBOOK.

THE YUKON REGION—ALASKA BOUNDARY.

ALASKA, the portion of the North American continent that most nearly approaches Asia, was first visited by the Russians in 1741. Half a century later the whole country passed into the possession of the Russian America Company. Russia retained it until 1867, when the territory was purchased by the United States for $7,200,000 in gold. This was the transaction that gave rise to the Alaska Boundary dispute between Canada and the United States to which public attention has recently been attracted by the protracted sittings of an International Commission attempting to settle the long-standing grievance. Though the line of demarcation was not strictly defined for a long period, it seemed a matter of little or no importance. Except, perhaps, the seal fishing of the Behring Sea, the wild and inhospitable region offered but little attraction to white men, who left the Indians, Russian half-castes, Eskimos, and a few Chinese to exploit the scanty resources of the country as best they could. But the discovery of gold in the Yukon district, and especially in the neighbourhood of the Klondike River, caused a thrill of excitement throughout the civilized world; and there followed a "gold rush" the like of which has perhaps not been equalled since the discovery of the precious metal in Victoria over fifty years ago. Popular interest was centred in the desolate regions that the geographical text-books had hitherto briefly dismissed in a few

lines, and no illustrated magazine was complete without illustrations of the new El Dorado, and the best routes by which to approach it.

The Boundary Line.

The boundary line between Canada and Alaska runs from the Arctic Ocean to within forty miles of the Gulf of Alaska, and there is no reason whatever to doubt that the best portions of the auriferous regions are well within Canadian territory. From this point, however, the boundary is in dispute.

As far back as 1825 a Russo-British treaty provided that the "boundary shall for a specified distance follow the summit of the mountains situate parallel to the coast; but whenever these are more than ten maritime leagues from the ocean the line shall be formed by a line parallel to the winding of the coast of ten maritime leagues therefrom." When the United States purchased the territory from Russia

the former took over the rights held by Russia under the treaty, the exact nature of which was called into question by Canada in the seventies. The coast is marked by deep indentations, and America claims that the ten leagues shall be measured from the head of the remotest waterway, while Canada maintains that the wording of the treaty applies only to the main coast-line.

After prolonged negotiations a provisional boundary was agreed upon on October 20, 1899, without prejudice to the claims of either party, and to finally settle the vexed question is the task allotted to the present commission. Having settled to which country the gold-bearing regions belong, there is at first sight little worth disputing in the possession of the narrow strip that runs southward with the coast-line; but unfortunately it is just at this point that the question of right of way comes into prominence.

Transport the Root of the Difficulty.

The approach to the gold regions is one of extreme difficulty, and the only practicable route, so far as Canadians are concerned, is *viâ* the Lynn Canal. This brings us at once to the crux of the difficulty. Does traversing this route mean an encroachment on American territory? The Americans answer in the affirmative; Canadians emphatically claim that Dyea and Skagway are well within their boundary; Americans claim possession of the towns, and at present the United States administers the affairs of both. However the point may be settled makes no difference to Canadian possession of the Klondike gold fields; but a decision in favour of the American boundary would give to the United States the control of the whole of the commerce of the regions concerned, a consummation that Canada strenuously opposes.

The Available Routes.

1. The Klondike may be approached from Canadian territory on the eastern side of the Rocky Mountains, but under present conditions the length and difficulties of the route render it practically impossible.

2. By means of a long sea voyage to St. Michael on Behring Sea, it is possible to reach steamers plying on the Yukon, by means of which the fifteen or sixteen hundred miles to Dawson City may be accomplished. The time occupied is very long, delays are frequent, and usually only heavy goods are taken this route.

3. The shortest and quickest method is to enter the country from the south. Skagway and Dyea, only four miles apart, are the best ports of entry. From these towns there are two parallel passes of about forty miles in length, running towards Lake Bennett. Both passes are steep and impeded by glaciers, and in winter snow to a depth of fifty feet presents an almost insuperable barrier. Even in summer there is insufficient vegetation to supply food for mule or horse. Chilkoot Pass is too steep and precipitous for pack animals. White Pass has offered no serious obstacles to the construction of a railway that now connects Skagway with the waters of Lake Tagish.

Miscellaneous.

The area of the Yukon Province is roughly 200,000 square miles, of which over 2,000 square miles are water, for the region is marked by countless lakes, water-courses, and morasses. The climate is very rigorous, the temperature varying on the coast from 70° F. in summer to 40° or 50° below zero in winter; in the interior 80° to 85° in summer, while in winter 60° below zero is frequently reached.

Beyond the trade in furs and skins, which is carried on by Indians and half-breed trappers, the whole region possesses but few possibilities, except in connection with gold or other metals.

The Yukon gold creeks offer no attractions to men who are not vigorous and robust and inured to the hardest toil. The genuine digger, however, does not complain at forbidding circumstances. Sweltering in tropical regions or toilsomely labouring within the Arctic Circle, he goes on with his quest, never over-elated by success or cast down by disappointment. Men such as these, possessing a little capital, are likely to do well in these regions. The journey to Dawson City is fraught with peril, especially if it is not undertaken just when the climatic circumstances are most favourable. The trail to Klondike is lined with victims enshrouded in the frost-bound earth—victims to the gold fever that urges on the pursuers of hastily-won wealth.

The method of Yukon mining is interesting. "The miners build fires over the area where they wish to work, and keep these lighted for the space of about six hours. Then, at the

expiration of this period, the gravel will be melted and softened to a depth of perhaps six inches. This is taken off, and other fires built, until the gold-bearing layer is reached. When the shaft is down that far, fires are built at the bottom against the sides of the layer, and tunnels made in this manner. Blasting would do no good on account of the hard nature of the material, and the charge would blow out just as out of a gun. The matter taken out containing the gold is piled up until spring, when the torrents come down, and is panned and cradled by these."

Within the last two or three years the conditions of life have generally improved. The Canadian Government enforces law and order firmly and judiciously. Dawson City, though so far from the centres of civilisation, is not by any means completely isolated, for Circle City, not far distant, has a mail once a month.

The Yukon regions have certainly assumed an importance but little dreamt of a few years ago, but it is impossible to estimate with any certainty the prospects of the country until the boundary dispute is finally settled.

A SERIES OF LESSONS ON A QUARRY.

ARRANGED ACCORDING TO THE "FIVE POINTS" OF HERBART.

BY W. D. LEWIS, LLANGATTOCK.

Hints to Teachers.

THE "Preparation" notes are those actually made from practical experience, as "ideas possessed by the child," but it is possible that in some classes these "ideas" may be too advanced. In this case this difficulty can be overcome by transferring the matter to "Presentation."

It is not meant that all the "Applications" or "Employments" can be carried out in every school; but as these notes are suggestive and not arbitrary, it is hoped that where any difficulty occurs in carrying out any part of these notes, it may lead to the use of other ideas associated with them.

Stage I.—The General Character of a Quarry.

PREPARATION (*what is already known*).	PRESENTATION (*of new ideas*).	ASSOCIATION (*illustration, comparisons and contrasts*).	FORMULATION (*blackboard notes, formula, etc.*).	APPLICATION (*by the children*).
Short talks in school, and in visits to the quarry or playground, to call into consciousness the ideas already possessed by the child.	This in the classroom and in the quarry or playground by an oral lesson. Readings on this subject another means of presentation.	References during presentation to comparisons and contrasts. The association of other ideas with those presented.	Focussing the facts of the lesson into a formula, or gathering these facts into blackboard summary.	Testing the efficiency of the teaching by applying the knowledge obtained to exercises of originality.
What is a quarry? The class is reminded of the hollow space excavated in the hillside as viewed above and below, and the long time taken to do such an amount of work.	Old buildings in the neighbourhood may serve to give some idea as to the age of some of the quarrying. Some can be traced to hundreds of years.	Compare stone used in the locality which came from some distance, as the Bath and Portland freestones used for facings.	A quarry is a hollow space excavated in the hillside, perhaps for many years, by the labour of man.	Write a letter describing a visit to a quarry, the work done by the quarrymen, etc.
The lateral lines or the lines of layers. By observing the lines, the class can say that one set runs from side to side, being long, continuous, numerous, roughly parallel, and varying in their distance apart.	The lines running from side to side are the edges of planes, or layers of different kinds of stone (see photograph C, where boys are placed on different layers).	Compare the layers of leaves in a book, or with three or more books. Hold the hands vertically parallel to the quarry face. The lines between and on the fingers provide a handy illustration of this.	The lateral lines mark the separation of different kinds of stone. (*N.B.*—To simplify the subject, I have omitted all reference to contorted or curved strata.)	Models and drawings to illustrate (by scale) the strata lines. Measurements made in the quarry by a cord and a measuring rod at the end, let down from above.
The lines of cracks or fractures. Recall any knowledge of earthquakes, either from actual experience or from reading descriptions. These lines—short, mostly perpendicular to the lateral lines—do not seem continuous, are irregularly placed. Insert a wire to know the depth of cracks.	The lines almost perpendicular to the above, and nearly vertical in the photographs, are cracks caused by movements of the earth in cooling. These help the quarryman to break up the stones, forming natural blocks.	Bake an apple: skin tense, sometimes bursts by the expanded juice. Let it cool: the juices contract; folds and wrinkles are formed. Compare. On clay soils contrast the cracks, not from cooling, but by the baking of the sun during hot, dry weather.	Other lines: many are perpendicular to the lateral ones, and are real cracks in the rocks, caused by the movements of the earth's crust.	Exercises in number: If there are twelve layers in 48 feet, how many to the bottom of the valley? (Ordnance Survey maps supply the contour lines for heights.)
The heaps of rubbish or useless material. The heap visited. It is noted that some are soft, crumbly stones, others harder, but broken up, some into powder. *The stacks of stone.* The children examine the kinds, and local use will guide them to recognise the classification.	The rubbish heap consists of broken stone, soft shales, and stones useless for building or for repairing roads. The stones are selected and put in separate heaps, as road-stone, flags, building-stone or wall-stone, quoins, etc.	Compare some specimens in the heap, making a collection of varieties for classroom reference.	Some stones are broken up too much, and are too shaly and brittle to be of any use. They are arranged outside the quarry in heaps, according to their use.	Visit any buildings constructed of this local stone, and note the varieties used according to their classification in the quarry. Local buildings containing imported stone.
The quarryman and his tools. The necessity of being strong and hardy workmen. The tools handled in the quarry; their uses. Bars, borers, blasting powder, water buckets, the fuse, shovels, hammers, sledges, mallets, wheelbarrows, and planks. Search for marks of boreholes, and see whether it is known what these marks are.	Bars for lifting; boring bars for the charge of blasting powder; water buckets to soften the rock, cool the bar, and to clean out the hole; the fuse to give the workmen a chance of escape from the explosion; tools for breaking up the stone.	Compare the use of the bar as a lever of the first and second order. Class use pencils or pens, with a book, to illustrate this. Compare the explosive force of gunpowder, in its change of state from solid to gas, with the power of steam, due to similar cause, or the change of liquid into gaseous "petrol" to move the motor car.	Strong tools and hardy workmen are required for the work. The change of state of the gunpowder, from the solid to that of the gaseous, is similar to the change of ice into steam. This causes the expansion, equal to 1,000 times its first volume.	Lift an average-sized block in the "stack," estimate its weight. Estimate the weight of a barrow-load of twelve to twenty blocks, pressing at that point of a plank where the wheel touches it. Problems as to the number of such stones to be placed in a wall of certain dimensions.

PHOTO. A. shewing the outcrops of 12 layers or Strata, each numbered.
RUBBISH
HEAP
POINTING TO THE FAULT

PHOTO. C
SHEWING TABLES OF
DIFFERENT STRATA
HILL SIDE
11 SHALE STONE
12 CONGLOMERATE

Stage II.—Rocks at a distance were worn away and deposited as sediment where the Quarry stands.

PREPARATION (*what is already known*).	PRESENTATION (*of new ideas*).	ASSOCIATION (*illustration, comparisons, contrasts*).	FORMULATION (*blackboard summary, etc.*).	APPLICATION (*to exercises of originality*).
Change of temperature and frost crumble the rocks: weathering. By judicious questioning, learn how much the child knows: that the dust of the roads and bare lands, the heaps of powdery mortar at the foot of walls, the heaps of earth and small stones at the base of cliffs and quarry, come from the crumbling of the rocks and stones.	Rocks expand by heat, and when cooled contract again. This happens so often that the face of the rocks crumbles. Water expands on freezing. If it expands in a crack of rock, it makes the rent wider, and perhaps breaks the rock, as it does a water-pipe.	A few experiments on expansion of other substances by heat and contraction by cold. Show the bursting of a closed vessel filled with water—the great strength of the force of expansion. Recall the expansion of gunpowder.	Rocks expand by heat and contract by cooling. These changes in bulk cause the rock to break up and crumble.	Wherever convenient, the children could perform experiments in the contraction and expansion of solid liquids and gases. Put a stone in the fire to show the cracking noise and any fractures.
Rains, dews, and mists dissolve limestones. Kettles having an inside crust of whitish material will be common in districts where limestone, marls, and marlstones abound. Use this knowledge to lead up to the inquiry as to the consciousness of this being a lime deposited by water.	Rain, dew, mist, snow, absorb CO_2 from the atmosphere. This water or moisture, falling upon limestone rocks, dissolves them, and thus Co_2 is a "degrading" force. Rivers carry off this water on its solution to the sea.	Make some lime water. Note the clearness of the solution. Spring water from limestone is clear and sparkling. Breathe into it through a tube; note cloudiness and the deposit of white powder. CO_2 has caused this deposit of lime carbonate.	Water containing CO_2 is a solvent of limestone rocks, which passes away unseen in the clear water until the lime carbonate is deposited by the evaporation of the water.	Vinegar or other acid poured on some of this kettle crust to show the re-formation of CO_2 and the white limy residue.
Running water wears down the hardest rocks. Why water is muddy. Why more so after floods. Evaporate specimens of river, spring, flood water, and the clear limestone waters. If by the sea, collect tidal waters for the same purpose.	The waves of the sea, in dashing water, sand, and pebbles against the coast, and the flow of rivers along their beds and against their banks, cause the waste of rocks.	Remind the class of the noise of the retreating waves over a pebbly beach, or a river in flood over a weir; any local waterflood or ravine. Compare the difference in the crumbling of the face of the quarry, the dark lateral lines especially marking the strata or layers quickest to crumble away.	Running water, especially when it carries along sand and gravel, and rolls the pebbles, wears down the river beds; and so the bombarding of a cliff by stones cast by the waves wears it away.	Write an essay on the wearing away of the rocks on the quarry face.
Glacial Period. Recall any ideas which the children have of glaciers in the Alps, etc.; the ice of the Arctic regions; icebergs and ice-sheets in the Arctic and Antarctic Seas.	Our country has often experienced an Arctic climate, and once since the present valleys and hills were formed. Then down the valleys slowly moved the ice-plough or glacier, large boulders and smaller rocks embedded in the ice, carving out the bottom of the valleys, and conveying huge mounds of débris to the foot of the glacier.	Visit local "drift" as mapped out in the maps of the Geological Survey (drift maps) of the district,* and compare the rounded pebbles, sand, and gravel with local soil above the line of drift. Compare a glacier and a river in the disintegration of the burden, and the deposit at its termination. * *Maps 3s. 6d. each.*	The valleys show deposits of material brought down by glaciers at a time when our country was partly covered with ice.	Examination of some glacial drift, as found in gravel beds, paths, etc.

INSPECTOR'S QUERY COLUMN.

LETTERS intended for this column should be addressed "Inspector," care of Editor, PRACTICAL TEACHER. Only in very urgent cases can replies be sent by post, and then only when two stamps accompany the letter.

De Serf writes: "I am engaged in a secondary school (Art. 51), no elementary school experience; what shall I gain by passing A.C.P.? I wish to advance my status, and go into an elementary school. Will A.C.P do in lieu of Certificate Examination?"

Answer.—We can trace no connection between (Art. 51) and "secondary school." If reference is made to the Day School Code, it will be seen that under Art. 51 (Schedule IV.) the diploma of A.C.P. is recognised as a sufficient qualification for an "assistant teacher," but it cannot take the place of the certificate. If *De Serf* will write again, and state age, qualifications, and give name and not initial (for an obvious reason), we shall be pleased to advise more fully through the post.

SCHOOL OF ART WOOD-CARVING.—The School of Art Wood-carving, South Kensington, has been reopened after the usual summer vacation, and we are requested to state that some of the free studentships maintained by means of funds granted to the school by the Technical Education Board of the London County Council are vacant. Forms of application for the free studentships and any further particulars relating to the school may be obtained from the manager.

A MEETING of the Executive Committee of the Non-Collegiate Certificated Teachers' Association was held in Russell Square on the 19th September, with Mr. A. E. Cook in the chair. A considerable time was devoted to a mass of correspondence, consisting chiefly of letters from teachers elected on the new Educational Authorities, and the seven candidates for the vice-presidency of the N.U.T. Great satisfaction was again expressed at the tone of the letters from the co-opted teachers. The replies from the candidates for the vice-presidency of the N.U.T. on the non-collegiate question were of such a favourable nature that it was decided to support no particular candidate. Respecting the motion of the last meeting that all certificated teachers be termed registered teachers, the secretary was instructed to again write the N.U.T. Executive. The Chairman then moved the following, seconded by Mr. Ward:—"This association is of opinion that it is grossly unfair to differentiate between the salaries paid to non-collegiate and collegiate teachers, seeing that both perform equal and similar work. This association earnestly appeals to those Educational Authorities whose scale of salaries shows such differentiation to reconsider their scale, with a view of equalising the salaries paid to non-collegiate and collegiate teachers." A long and animated discussion followed, Mr. Cook pointing out that in addition to non-collegiates, in many cases, being debarred from holding headships, the differentiation between the two classes of teachers respecting salary was becoming, under the new bodies, more acute than ever. Miss Broome spoke very strongly on the matter, stating that it will need very energetic yet tactful treatment to prevent any differentiation between the two classes. Mr. Gale spoke in a similar strain.

The Practical Infant-School Teacher.

OUR MODEL INFANTS' SCHOOLS.

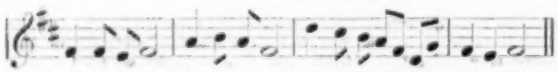
XVIII.

"I do not wish to find a better equipped and appointed school than this. The organisation seems to me to be perfect, and the children are happy in their work."—H.M.I.

THIS was the opinion of a real educational expert some twelve months ago, and although it is printed at the head of the article, it was not shown until after some pressure had been brought to bear on the mistress almost at the close of a visit to her school. She would modestly have kept it quite out of sight.

The morning opened fine, and at nine o'clock to the minute I entered the corridor. The children were in rows of twos, and all turned towards the centre, where stood a teacher with a "clicker" in hand ready for use as a signal. At the far end of a hall, measuring thirty-five feet by sixty feet, a pupil teacher sat at a piano, while at the desk near by the mistress had taken her place, awaiting the entry of her little charges for the day. Beyond, in another corridor, were children arranged as in the one just entered. The teachers were each at the head of their classes.

The children must have gone through the corridors some time previous, for all were disrobed and ready to enter the hall. The clothes were hanging on the pegs. The "clicker" sounded, and the teacher at the piano struck a chord. When this was heard the children marked time four beats very lightly, for the floor of the corridor is asphalted. Then they commenced to march into the hall. On reaching the door they sang,—



Twice one are two. Twice two are four. Twice three are six. Twice four are eight.

and so on through the table, keeping time as they marched. Then without a break in the march the singing ceased, and the teacher played through the melody. In the same way three times table was sung, and so with similar breaks after each, to the end of six times. The effect was very pretty, and the marching was splendidly done. The melody, with a little variation in the long words, such as twenty-seven, suits the tables admirably. After six times had been finished, and several repeats of the air had been played, all the children were standing at lines marked in black on the floor facing the mistress at her desk.

"Good-morning, children," from her was answered by "Good-morning, Miss R——," and "Good-morning, teacher." The teacher of each class responded to her own "Good-morning, children."

The hymn "Gentle Jesus, meek and mild" was sung, and the Lord's Prayer recited. This over, the children were called upon to repeat their "Code of Manners," which was as follows:—

Mistress. "Early."

Children. "I am glad I am early at school this morning, and I will try to be early every time I come. I must come at five minutes to nine in the mornings, and five minutes to two in the afternoons."

Mistress. "Behaviour."

Children. "All this day I must be tidy. When I speak to my parents, to my teachers, and to my friends, I must feel kind and be polite. I must be good-tempered and pleasant too. When I play I must not be rough, and when I am at home I must behave as well as I do at school."

Mistress. "Manners."

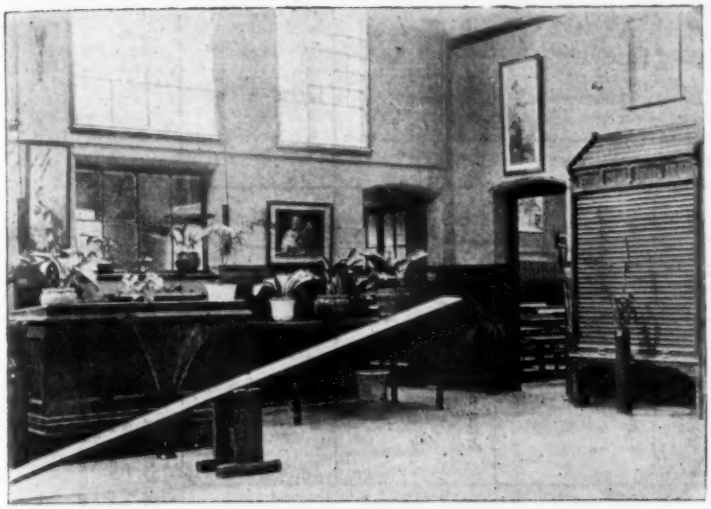
Children. "The good fairies 'Please' and 'Thank you' will help me to remember all my rules."

The children repeated their part with exceedingly good expression, and by their earnestness one could easily imagine they quite understood what they were saying. "Very nicely said, children," from the mistress pleased them very much indeed, and no doubt gave them encouragement for the day. After a pause for stillness the order was given to turn, and when this was done several times, for the sake of practice as well as for effect, the classes marched to music to their respective rooms. The hall was thus cleared, and an introduction to the mistress and a chat with her were made possible. Never mind what nice things were said by way of compliments; let us get to work.

To examine the papers that had been done by the children during the year was a very easy matter, for they had been carefully tied together, lesson by lesson, and stored in a cupboard near the desk. They included arithmetic, handwriting, drawing, and several different forms of kindergarten work. The excellence of the work done by the standard children was most striking, and would do credit to a class of much older children. The arithmetic was done on paper ruled in quarter-inch squares. Regularity of figures and columns was thus secured. To add to the neatness of the papers, the teachers had marked the exercises with great care. The writing was in every case in lines suited to the children, those of the standard being for large hand half an inch with a faint line through the middle for joining purposes, and for small hand lines of a quarter of an inch apart were used. The copy books for this class were Nelson's Royal Series, Nos. 2 and 3. These provide practice in short words, the former using letters entirely within the lines, the latter containing letters which go above and below the lines. A good use is made of the filled copy books of previous years. The headlines have been carefully detached from the books, preserved, and used over and over again for transcription purposes. The special way in which these copy books are arranged makes this double use a very simple matter.

One could linger a long time without fatigue looking through the exercises, especially as the examination of them was made interesting by the remarks of the mistress as she showed them concerning this or that child. She knew each one thoroughly, and had a good idea of the circumstances of each lesson. How a blot on a paper was caused, or what prompted a special design, were things that were remembered.

The sewing-basket was a marvel. In it were knitted scarfs, pincushions, hemmed handkerchiefs, and several patterns of hand-made lace. Indeed, as an auctioneer says there were things too numerous to mention. Each article showed by means of a label the name of the child whose



VIEW OF THE HALL—SEE-SAW.

little fingers had made it, and the date of finishing. At the close of the school year the results of the sewing lessons will be displayed in the hall, and the parents invited to see and purchase them.

A somewhat rapid visit to each room showed that the arithmetic had been taught on the usual demonstration system. The blackboards were plentifully filled with illustrations; and the teachers must have carefully prepared their lessons, for there was an abundant supply of objects ready at hand for use. In the standard the tens were written on the blackboard in red, and the units in white. This plan was adopted for the purpose of making the columns of figures quite distinct one from another. "Number" in the baby-room had been made interesting from the fact that this being Wednesday morning, and the fifth time the children had come to school, "five" was the number dealt with. "Five" was in every example: a group of children, three boys and two girls, one boy and four girls, etc.; five apples in pyramidal form on a plate, four forming the base (four and one); attentive children called from the class and given five pushes on the swing, the times being counted by the class simultaneously; a little one sent into the corridor to knock on the outside of the door five times, these also being counted by the children. These are a few of the examples of the apparently unlimited resources of the teacher. The figure five was largely displayed on the blackboard too, and the children had written a copy of it several times in fine sand held in trays.

The sounding of a gong in the hall reminded the teachers of the time to change lessons. Recitation was the lesson due. We are still in the baby-room, and we watch the putting away of the sand-trays. To help in this a pupil teacher came in from another room—a point which showed the careful organisation of the school. She left when the trays had been "shelved" and the front of the cupboard drawn down. The babies had learned several pieces of recitation during the year, and the teacher asked them which they would like to repeat. This came to mean which they preferred to commence with, for in all they repeated six pieces. They were accompanied in each case with appropriate actions. "Kitty and Mousie," a well-known recitation, was said and acted splendidly. The "performance" was done by two little girls, who went into a corner of the classroom where there was a fairly clear space. One of them pretended to be pussy, and the other mousie. As the class recited the lines the two children played their parts. The piece is not copyright, so we produce it with the actions used.

"Once there was a little kitty[1]
White as the snow;
In a barn[2] she used to play
Long time ago.

"In the barn a little mousie
Ran to and fro,[3]
For she heard the little kitty[4]
Long time ago.

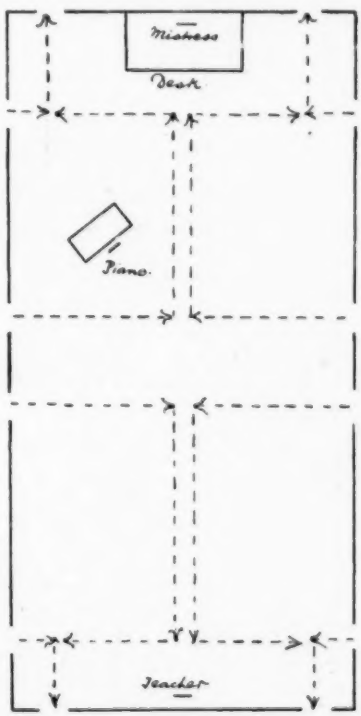
"Two black eyes[5] had little kitty,
Black as a crow,
And they spied[6] the little mousie
Long time ago.

"Four soft paws[7] had little kitty,
Paws soft as snow,
And they caught the little mousie[8]
Long time ago.

"Nine pearl teeth had little kitty,
All in a row,[9]
And they bit the little mousie[10]
Long time ago.

"When the teeth bit little mousie,
Mousie cried 'Oh!'[11]
But she slipped away from kitty[12]
Long time ago."

One of the little mites afterwards told the story of kitty and mousie in her own way, as an example of oral composition. She told it very daintily, too; but it was evident that she was not a novice at story-telling. The way she used her lips in speaking was a treat to witness.



PLAN OF MARCHING.

Playtime was now announced, and we entered the hall again to watch the exit of the older children. The classroom

[1] Children pointed to little girl who had crouched on the floor in the corner.

[2] Pointed again. [3] The child acting mouse ran here and there about the floor in what space was available, pretending to look for pussy, who (4) was scratching on the floor where she crouched. [5] Children pointed to their own eyes. [6] Pointed to child playing the part of mousie. (Meaning of "spied" quite understood.) [7] Children show hands and point to feet, indicating *four*. [8] Pussy sees mousie, and with a spring seizes her. [9] Children point to their own teeth, and by drawing finger across mouth indicate "row." [10] Pussy pretends to gobble up mousie. [11] Mousie squeals, and (12) wriggling out of pussy's clutches, slips off to her seat, leaving pussy bewildered and disappointed.

TIME TABLE.

Class.	9 to 9.30.	9.30 to 9.35.	9.35 to 10.10.	10.10 to 10.40.	10.40 to 10.55.	10.55 to 11.25.	11.25 to 11.55.	11.55 to 12.		2 to 2.5.	2.5 to 2.20.	2.20 to 2.25.	2.25 to 2.50.	2.50 to 3.30.	3.30 to 4.	4 to 4.25.	4.25 to 4.30.
Babies.	ASSEMBLY, PRAYERS, RELIGIOUS AND MORAL INSTRUCTION.	REGISTRATION.	Number.	Word Practice.	RECREATION.	Writing.	Recitation.	DISMISSAL.	MONDAY.	ASSEMBLY.	Word Practice.	REGISTRATION.	Physical Exercises.	Kindergarten.	GAMES AND PLAY.	Optional.	DISMISSAL.
I.			"	"		"	"				"		"	"		"	
II.			"	"		"	"				"		"	"		"	
III.			Arithmetic.	Reading.		"	"				"		Musical March 9.	"		"	
Stand.			"	"		"	"				"		"	"		"	
Babies.			Number.	Reading.		Object Teaching.	Singing.		TUESDAY.		Word Practice.		Trans. of Figures.			Kindergarten.	
I.			"	"		"	"				"		"	(Boys) Drawing.		"	
II.			"	"		"	"				"		"			"	
III.			Arithmetic.	"		"	"				"		"	(Girls) Needlework.		"	
Stand.			"	"		"	"				"		Tables.			"	
Babies.			Number.	Word Practice.		Writing.	Words of Songs.		WEDNESDAY.		Musical March 9.		Word Practice.	Drawing.		Conversation.	
I.			"	"		"	"				Physical Exercises.		"	Free Drawing.		"	
II.			"	"		"	"				"		"	"		"	
III.			Arithmetic.	Reading.		"	"				"		"	"		"	
Stand.			"	"		"	"				"		"	"		"	
Babies			Number.	Reading.		Object Teaching.	Singing.		THURSDAY.		Word Practice.		Transcription.			Kindergarten.	
I.			"	"		"	"				"		"	(Boys) Drawing.		"	
II.			"	"		"	"				"		"			"	
III.			Arithmetic.	"		"	"				"		"	(Girls) Needlework.		"	
Stand.			"	"		"	"				"		"			"	
Babies.			Number.	Word Practice.		Writing.	Recitation.		FRIDAY.		Physical Exercises.		Stories.	Kindergarten.	Games and Play.		
I.			"	"		"	"				Musical March 9.		"	"	"		
II.			"	"		"	"				"		"	"	"		
III.			Arithmetic.	Reading.		"	"				Physical Exercises.		"	"	"		
Stand.			"	"		Composition.	"				"		"	"	"		

Notes on Morning Lessons.

1. Number lessons are preceded by five minutes' sharp questioning.
2. Arithmetic lessons are preceded by ten minutes' mental on Tuesdays, Wednesdays, and Thursdays.
3. Reading is tested for marks on Thursdays, and arithmetic and writing on Fridays.
4. Classes I. and II. take singing lesson in hall on Tuesdays.
5. Class III. and the Standard ditto on Thursdays.
6. Word practice is taken from reading sheets.

Notes on Afternoon Lessons.

1. Word practice is invariably from blackboard.
2. Backward lessons to be taken where marked "optional."
3. Games are either indoor or out of doors (if fine).
4. "Free drawing" at children's own choice (under supervision).

doors were all thrown open, and each class stood in lines in their rooms ready to march when the signal for doing so should be given. The mistress took her place at the desk, the senior teacher stood at the opposite end of the hall, and a teacher sat at the piano, which had been drawn towards the centre of the hall. The piano stands on a kind of platform with wheels, and a shaft is easily attached to it, and thus it is easily moved about, and with as little vibration as possible. The accompanying plan explains how the marching was managed. The lines were kept true and the corners square, the whole exit occupying only a few minutes.

It was a magnificent sight, and it showed how carefully this part of the children's training is attended to. The pupil teachers went into the playground with the children and entered into their games, while monitors (in every case girls) stayed behind with the teachers to help to prepare for the coming lesson.

The lesson was reading.

Reading is taught by what is known as the "Combined" Method—a mixture of the "Phonic" and "Look-and-Say" systems. When reading books and sheets are not used, the exercises are written as they are wanted on the blackboard. In the five-year-olds' class the following was the practice through which the children were put:—

1. *ab, cab, dab, fab, gab, hab, lab, mab, nab, pab, rab, sab, tab.*
2. *et, det, fet, get, let, met, net, pet, ret, set, wet.*
3. *bun, fun, run, sun, nun, pun.*

In exercises one and two the words are in alphabetical order, and were written at the teacher's own choice; but in exercise three the words were suggested by the children. While the words remained on the blackboard the teacher pointed to them one by one, and as she pointed the children pronounced them simultaneously. After a time, when it was considered they were known fairly well, they were rubbed off, and the children were asked to supply words of their own—words they could remember having used, or read, or heard. As they were given they were spelt by the giver, and written on the blackboard by the teacher. These are some of the words—*less, rap, mark, give, ask.* To show the value of word-building when used in conjunction with the reading lessons, the teacher used the first word *less*, and asked what it would be, and how spelt, if *-on* were added; *-id* to *rap*; *-n* to *give*; also what would *mark* become when *re-* was joined to it at the beginning. They were also asked to make *ask* into another word. The answers were *mask* and *task*. These words were now used for simultaneous practice —*lesson, rapid, remark, given, task, mask.* They were considered difficult, but it is no uncommon thing for the children to supply even more difficult words than these. A further exercise—and a very good one at this stage of learning—was provided by the teacher writing words on the blackboard, and after having them pronounced as they were written, altering one or more of the letters, the children telling what the word had become and *how* it had been changed. The examples were—*trot, treat; small, smell; for-got, for-get; part, port; such, much;* and a very hard one—*short, shirt.* The whole lesson was given in a very able manner, not the least feature of it being the sympathetic encouragement given to the children by the teacher, and the wonderful patience she displayed. In all, about fifty words were used. In addition to the actual "word work," the children used some of the words in sentences. The following are examples:—

Mark: I like to have a good mark.

Wet: My slate is wet.

Sun: The sun shines this morning.

It was impossible to watch the teaching of all the classes, but in every case the blackboard was thoroughly employed, even where books and sheets were used.

MAYPOLE DANCE (BY INVITATION).

STUDENTS' DAY—EXAMINATION OF DRAWING.

As a change from the ordinary lessons, the standard and six-year-olds' classes were brought into the hall for a singing lesson. As in the early part of the morning, the time of marching was utilised, the song "Peep-ee-bo," from Mrs. Walker's *Action Songs and Games for Young Children*, being sung. It is an excellent song for the purpose, and the accent in the marching is improved by its use. During the lesson voice exercises and modulator work by hand-signs preceded the songs as they were announced one by one. This helped to keep the voices in tune. One of the songs, "See-Saw," from the book just mentioned, was illustrated. Two children came to the front opposite the mistress's desk, and as they enjoyed the see-saw (see illustration), the children sang the words over and over till the signal was given for the last time. (This song book is published by Messrs. Curwen, price 2s. 6d. In it there are several songs of exceptional merit, and all are appropriate for infants' use.)

There is some attempt at correlation of subjects. Drawing and the conversational lessons on the seasons go together; so do object lessons and conversation; while a study of the time table, which is appended, will show that a repetition of a lesson in some other form is often made.

The apparatus is very extensive, kindergarten materials forming the chief illustrations of the teaching. Letters in the baby-room are practised by Gifts 8 and 9, and wetted strings are made into letter shapes by means of wooden knitting-pins. Writing is done in sand.

Occupations are of a varied character, the most interesting being that of the standard children, who rule regular patterns and cut portions out in coloured paper. In this case the ruled work forms part of the drawing lesson, and is done on the back of the coloured paper. A kind of mosaic work is produced by this system. It is fascinating to the children, and as a "show" at exhibition time it is very attractive. Games are used as means of rest from lessons, and as regards the standard children some attempt has been made to establish organised games in the playground. In fine warm weather the Maypole Dance is performed out of doors, and on these occasions people from the street are not prevented from entering the playground to watch. On one or two occasions the children have been invited to show their skill in this direction away from school. Once they went a distance of twenty-six miles, at the invitation of a titled lady, who was entertaining the Primrose dames of her county. The influence of the school has in these ways been widened, much to the school's advantage. It is well known beyond its own district, and its work is highly valued and appreciated.

The school is periodically visited by the students of at least three training colleges, those from the nearest going in groups of six or seven as often as college circumstances will permit. One of the illustrations shows how future drawing inspectors should be trained.

AN ACCEPTED SCHEME.

INFANTS' DEPARTMENT.

Part I. Reading, Writing, and Arithmetic.

A. Reading, with its kindred subject **Word-making.**

BABIES.

a. To be able to sound at sight the consonant letters, both small and capital.

b. To know the *long* sound of the vowels, and the *short* sound when preceded by a consonant.

[*Teacher's Notes.*—1. In teaching *a* and *b* use the kindergarten alphabet box, and deal first with letters made by using vertical and horizontal straights—namely, E, F, H, I, L, and T; then with the straights in a vertical and an oblique position—namely, A, K, M, N, V, W, X, Y, and Z; next, the letters which can be made with straights and curves—namely, B, D, J, P, R, and U. Teach the remaining letters in the following order: O, C, Q, G, and S. 2. With these teach the corresponding small letters, notwithstanding the fact that some of them are hard. The difficulty is more than counterbalanced by companionship, or the association of ideas. 3. Revise constantly, and by as many different methods as you can suggest.]

c. To be able to sound a word of two letters.

[*Teacher's Notes.*—1. Continue to use the alphabet box; let the children *make* the words, and have the words you teach printed on the blackboard. 2. In word-making commence with a consonant followed by a long vowel, leaving out *ai*, *oe*, etc., and *q*, *x*, and *z*. 3. Take next a short vowel followed by a consonant. 4. Last, take a consonant followed by a short vowel.]

d. To know the preceding from reading sheet.

[*Teacher's Note.*—When the children read from the reading sheet, see that expression is overdone rather than omitted. Actions must accompany the reading whenever possible.]

CLASS I. (aged four).

a. To know words of two letters, the consonant coming either *before* or *after* the vowel, and the vowel being either *short* or *long*.

[*Teacher's Note.*—*ăm* or *ām* will be accepted as correct at this stage, but use *long* vowels before consonants sparingly.]

b. To know words of four letters where the word can be made into two parts, each of which is a word—for example, *up-on*, *in-to*, etc.

[*Teacher's Notes.*—1. This is a more progressive way than by going to *c* first. It is, in fact, easier, though not commonly practised. 2. Keep children away from such words as *al-so* at present.]

c. To know words of three letters of regular formation—for example, *bat*, *mop*, *art*, etc.

d. To be able to change the initial, final, or middle letter of such words as in *c*—for example, *mop* into *sop*, or *map* into *mob*, etc.

e. To read with expression from Nelson's Royal King Primers I. and II.

CLASS II. (aged five).

a. To know sound of two consonants coming together, and to be able to use them preceding a vowel.

[*Teacher's Notes.*—1. Teach these words as far as possible from the known *three-letter words:* for example, from *lot* make *tr-ot*, *sh-ot*, etc. 2. The best combinations of consonants at the present stage are *fr*, *cr*, *tr*, *cl*, *th*, and *sh*. From these a large number of words (with the known words) can be made.]

b. To know the irregular words from Nelson's Royal Infant Reader I.

[*Teacher's Notes.*—1. Collect a list of these, and practise a few of them from the blackboard every day. 2. The following are examples of what is meant by irregular: *was*, *one*, *are*, *thy*, etc.]

c. To know words in which double consonants and double vowels are used.

[*Teacher's Notes.*—1. There are apparently two stages in *c*, but in reality there is only one. The children will be just as ready to sound *sh-ook* as *l-ook*, *fl-oat* as *b-oat*, etc. 2. The best double vowels to practise with at this stage are *ee* and *oo*, and the best *first* words are such as *fr-ee*, *tr-ee*, etc., where the double vowel finishes the word. 3. Introduce *ea*, *oa*, and *ou* later.]

d. To know the alteration of vowel value when *e* (mute) is put at the end of such words as *măt* (*māte*), *păst* (*pāste*), etc.

e. To read with expression from Nelson's Royal King Infant Reader I.

CLASS III. (aged six).

a. To know words ending with a double consonant.

[*Teacher's Note.*— *-ng*, *-lt*, *-rk*, *-th*, *-ch*, and *-st* are the commonest combinations. Make a collection of words ending with these, and use them for blackboard practice.]

b. To know such words as *to*, *too*, and *two*; *ale* and *hail*; *no* and *know*, etc. To show by sentences that the meanings of such are understood.

c. To know that *q* is always followed by *u*.

d. To know that *ph* is sounded as *f*.

[*Teacher's Note.*—A collection of words under *b*, *c*, and *d* will be necessary for use on blackboard.]

e. To read with expression from Nelson's Royal Infant Reader II.

CLASS IV. (Standard children).

a. To know the common word-endings, and to be able to use them with given words.

b. To know silent *-b* at end of words.

c. To know that letter *-y* is used for sound of *i* at the end of a word.

d. To be able to build up and pronounce any regular syllable, whether used singly or as helping to make a long word.

[*Teacher's Notes.*—1. The commonest word-endings for children at this stage are *-ing*, *-ed*, *-er*, *-est*, *-less*, *-ness*, and *-tion*. 2. Collect words where these endings can be added, and use them for blackboard practice. 3. Collect words under *b* and *c*. 4. Under heading *d* there should be no difficulty with such words as *un-der-stand-ing*, *in-di-vid-u-al-ly*, *men-tion-ing*, *con-ver-sa-tion*, etc.]

e. To read with expression from Nelson's Royal King Infant Reader II. (as in previous class), and also from Nelson's Royal Prince Reader, Book I.

B. **Writing,** with **Composition** for Standard children.

BABIES.

a. Pencil drill.

b. To write from blackboard script copy in sand with pencil such words as are not taken above or below the lines.

[*Teacher's Notes.*—1. Let the children draw their own lines, with a centre (or middle) line for guide. 2. Teach the letters in groups as follows:—

i, u, w; n, m, r, v; o, a, c, e; s.

3. Teach combined letters in easy stages—

re, ve, se; ra, ro, sa, so

coming last.]

CLASS I.

a. To write on paper, from script blackboard, copy words of three letters, all three being within the lines.

b. To write easy combinations of two letters, one of which lies above or below the lines.

c. To write easy combinations from printed blackboard copy.

d. To write easy words from dictation.

[*Teacher's Notes.*—1. The headings *a*, *b*, *c*, and *d* indicate the stages of instruction. 2. Large hand only to be practised. 3. No capital letters to be used.]

CLASS II.

a. To write on paper, from script and printed blackboard copy (large hand only), words which are used in reading and word-making lessons.

b. To write the capital letters on Sheet No. 5 of Nelson's Royal Writing Wall Sheets.

c. To write from dictation easy lesson words.

CLASS III.

a. To write on paper, from script and printed blackboard copy (large hand only), words which are used in reading and word-making lessons.

b. To write, in addition to *c* of Class II., the capital letters on Sheet No. 6 of Nelson's Royal Writing Wall Sheets.

c. To write easy words from dictation. (Capital letters to be used.)

CLASS IV.

a. To copy from printed blackboard copy, reading sheet, or reading book a simple sentence, using small and capital letters. (Large hand and half-large hand.)

b. To show writing in Nelson's Royal Copy Book, No. 6.

c. To write an easy sentence from dictation.

d. To write easy sentences from memory, and as an exercise in composition.

C. **Arithmetic,** with **Mental Arithmetic.**

BABIES.

a. To be able to place number pictures up to and including *six*.

b. To be able to decompose numbers up to and including *six*.

c. To count up to *ten* and back to *one*.

d. To count one forwards and one backwards. (See Note 4.)

e. To be able to write the figures 1–6 in sand.

[*Teacher's Notes.*—1. Whatever is done in teaching number, let it be done by the method of decomposition, and by as various ways as possible. 2. Objects, picture numbers, etc., must always be used. 3. "Let the children learn by *doing*."—H.M.I. 4. As regards *d*, take simultaneous and individual exercises, such as counting: 1, 2, 3, 2, 1; 2, 3, 4, 3, 2, etc.]

CLASS I.

a. Number pictures as in babies' class up to and including *nine*.

b. Decomposition of numbers up to and including *nine*.

c. To count by *ones* and *twos* up to and including *twelve*.

d. To count to *twenty* forwards and backwards.

e. To be able to write all the figures on paper.

CLASS II.

a. Decomposition of numbers up to and including *twelve*.

b. To be able to count by *ones* and *twos* up to and including *twenty*, and to *forty* forwards and backwards.

c. To know the signs +, −, ×, and ÷.

d. To be able to set down and add numbers up to *four*.

CLASS III.

a. Decomposition of numbers up to and including *twenty*.

b. To be able to count forwards and backwards up to and including *fifty*.

c. To count by *ones*, *twos*, and *fives* up to and including *thirty*.

d. To learn the pence value of a shilling, and do little exercises in spending.

e. To be able to set down and add numbers of units and tens, but without "carrying" from the units.

CLASS IV.

a. To learn (as in Class III.) the decomposition of numbers up to and including *twenty*.

b. To be able to count up to and including *ninety-nine* forwards and backwards.

c. To count up to a *hundred* in *twos*, *fives*, and *tens*.

d. To know the shillings value of a pound (£), and to work spending exercises.

e. Written exercises in the four rules.

f. Tables up to six times nine.

(*To be continued.*)

THE STORY OF A DROP OF WATER.

(*Recitation for Standard I. or II.*)

BY SISSIE TURLEY.

A THOUSAND drops of water are glistening in the sun,
Around them thousands more are joining in the fun;
They dance and bubble upwards, their colours show in flashes,
Then leaping over little stones, they break in tiny splashes.

The sun is strong, and looking on, he makes the drops feel lighter;
He warms the earth, the sea, the air, and everything is brighter.
But very soon his voice is heard—heard clearly by the water:
"Come, leave the stream, I want you here; come, be my little daughter.

"The lovely clouds my children are, they float along quite near me;
I bring them from the earth below, and yet they do not fear me."
The drops of water gladly hear; they leave the town unsightly,
And soon become a silver cloud, which glides along so lightly.

The clouds can see the cities large—they see the children playing;
How very few look up and catch the words the clouds are saying,—
"The God who made the boys and girls formed us in all our beauty;
The sun and moon have each their work, the children too their duty."

But now the sky is turning black, the clouds are coming lower;
A hilltop meets them as they move—they burst into a shower
Of lovely sparkling little drops, which, falling on the grain crops,
Make all the thirsty land feel glad. How welcome are the raindrops!

Some of the drops are not required under the ground to go,
So these run trickling down the hill into a stream below;
And here a thousand raindrops are glistening in the sun,
And, as before, a thousand more are joining in the fun.

Our Modern Language Section

A HOLIDAY-COURSE PROMENADE.

"LAKE LEMAN flows by Chillon's walls," but it flows by much else of happier associations and of not inferior beauty. Eastward from Lausanne it is a fair and fertile land that slopes towards "clear, placid Leman," and the beer of that land is good.

One bright and warm afternoon in the month of August—a month of chilly and humid memory to so many holiday-makers at home—a band of some fifty or more "holiday students," if one may use that self-contradictory phrase, met at the tramway kiosk at Lausanne to enjoy one of those "promenades" that temper the severity of their application to literary and other studies. By the courtesy of one of the professors who devote part of their vacation to the help and encouragement of school teachers in this well-known holiday course, we were enabled to join ourselves to the promenaders. The direct result was a memory which we shall treasure, and an incidental result—assuming that the editor of this journal is able and willing to find space for the reminiscence—may be that some of our readers will be led to enroll in the same type of course on some future occasion.

The town of Lausanne, with its picturesque jumble of quaint, mediæval streets, steep and narrow, and of palatial public buildings and luxurious hotels, was soon left behind, and our straggling band were giving unwonted life to the pleasant country road which winds downwards to the lake, among vineyards, orchards, gardens, and hayfields. The colour, and the fragrance, and the music of the autumn were all around.

The colours of that Swiss landscape, known, doubtless, to the artistic reader, were relieved by and blended with other colours known only to lady readers, for the majority of that band were ladies in costumes appropriate to the season. The music of the manifold sounds of nature was blended with a deeper and more significant music—the music of the human voice, expressed for the most part in French of very varied qualities; for was it not just to improve their French that our band had met together from so many lands? And there was not wanting the more universal music of the laughter that speaks the "vacant mind." The fragrance of the flowers and the new-mown hay was not unmixed with a fragrance that speaks eloquently of the presence of the lords of creation—the incense that arises in grateful clouds from a weed not indigenous to Swiss soil.

Two or three very short miles bring us to an unpretentious restaurant by the shore, too small, as it seems, to afford room for half our company. But our leader knows what he is about. We pass through the little courtyard, and behind it, just on the edge of the water, which it actually overhangs, we find a spacious pavilion, raised on a rocky point, consisting simply of a platform with an overshadowing roof, and amply supplied with tables and benches. This is our goal. Here we all are, professors and students in plenty. We wonder a little what the next part of the programme may be. Some improving talk on the locality through which we have just passed, no doubt, or on the magnificent panorama of lake and mountain which is now spread out before us. We make up our mind to enjoy it, but we should almost prefer to do without.

For a moment we sit pensive, baring our scanty locks to the genial breeze, when our meditation is interrupted by a question, which is, being interpreted, "What will you drink?" With commendable presence of mind we give the proper answer to this unexpected query, and we are effectively recalled to the realities of the situation by seeing a sight which, in our own student days, would have been regarded as an unreal vision—a distinguished professor (one of the ornaments of the University of Lausanne, to whose able discussion of French oratorical style we had listened with so much pleasure in the forenoon), threading his devious way among the lively crowd, while he held aloft in one hand three brimming tankards of cool lager, and nursed his pipe—or was it a cigar?—with the other. "This," we said, "is the New Education. It is better than the old."

The excellent example set by the professor was not lost upon the students. We hope his other lessons will bear as much and as immediate fruit.

By-and-by throats are satisfactorily moistened by the aid of various fluids designed for such service, and the genial professor of music deems the time fitting for his part of the prearranged programme. A capable corps of vocalists, men and women, take the floor, and books of music are produced. A selection of part-songs is tunefully and vigorously rendered, and those who "assist," in the French sense of the term, are not sparing in rendering well-earned applause.

The fatigue of singing and listening is repaired by another social interval, devoted to talk grave and gay, punctuated with many a hearty laugh, which becomes more hearty still as we observe a group of light-hearted and irrepressible ladies who have climbed down to the water-side to cool their hands in the lake, and have now turned their energies in the direction of trying to splash one another in the most liberal way with the pale-green water of historic Leman. The discovery that they are playing to so large a gallery brings the impromptu performance to a sudden close, and ere we can accord the palm to the victors, we are once more called on to listen to another selection from our voluntary choir.

This part-singing, it should be mentioned, is not simply a means of adding to the enjoyment of the class promenades, but is a valued part of the course, designed to give the students a special form of exercise in the pronunciation and accent of the French language, which forms the centre of the whole course of instruction. It strikes an observer as being an eminently practical as well as a pleasant form of exercise, and well calculated to attain the end for which it is designed.

As the afternoon wanes, glasses are emptied and filled again, and, as is most proper, emptied for the last time. What particular number corresponds to the word "last" in this connection is a matter of individual choice, and need not be further investigated here. But, after all, one must return. There was a fluttering of wings and a preening of feathers, a lighting of matches—Swiss ones, which take their time to light—and a setting down of glasses which have done their duty, and we are once more on the dusty white highway.

This time our leader varies his route, and we stroll slowly along the shore towards Ouchy, watching the great mountain wall of Savoy purpling in the evening light, the busy little steamboats scoring the deep shadows with trails of ripples, the lazy lateen sails of the lake craft spread crosswise like the wings of huge sea-birds, the active rowing-boats in the foreground, and, nearer still, the "band of hope" perched on the wall of the esplanade, tempting to the dry land those elusive fishes which seem proof against all such

temptations—at least, the only thing we can remember having seen actually drawn out of the water was a Panama hat, which had been only a very short time therein.

At Ouchy the promenade ended, so far as we were concerned, for the charms of the *funiculaire* as a means of ascending the steep hill prevailed over our desire to prolong the walk.

In such pleasant wise were we introduced to one of the most famous and most popular of the many vacation courses which are now found dotted over the Continent, especially in French-speaking lands. The Lausanne summer course is not frequented by English students as it yet will be. Owing to the lack of suitable accommodation in the university, those in authority have not laid themselves out to attract our teachers. The available space is in the meantime fully occupied by others. From Russia especially a large number of students come every year. The intimate acquaintance with Russia and with the Russian language which is possessed by one of the leading professors is probably one of the reasons for this connection; and were the conditions favourable, we have no doubt his equal familiarity with England and with the English tongue would prove a similarly strong attraction for our young teachers. The completion of the magnificent pile of buildings now in course of erection beneath the shadow of the castle will soon solve the problem of accommodation. The renown of the university and the charms of the city as a place of temporary residence should then make Lausanne as favourite a centre for holiday students as it already is for those young people who are sent to receive part of their education abroad.

We can imagine no better place for a summer course in French, especially for teachers. Lausanne is proud, and has reason to be proud, of its position as regards education. Its common schools are palatial, and its provision for higher education is worthy of the foundation laid in them. The summer course, too, is not a matter of indifference to the town. One of the promenades, unluckily past before our arrival, consists of a day's sailing on the lake, the steamer being provided by the steamship company, and a banquet being given by a neighbouring town on the lake. This is a very practical evidence of the popular appreciation bestowed upon this educational work. The Swiss believe in education, and a short residence among such a people is as a breath of purer air to one whose work lies among those who have not yet learned to do so, but who receive it under protest, like a nauseous but necessary medicine.

It may be of interest to prospective students to give by way of conclusion a summary of the work which has engaged the class during the course now closed, extending over the six weeks from 21st July to 29th August, in two periods of three weeks each. The lectures dealt with the following subjects:—Questions of Contemporary Politics; History of the French Language; Studies in the History of French Literature; the Phonetics of Modern French; French Style in its relations to German, English, and Russian; Studies of Style from the Great French Writers; New Methods of teaching Living Languages; and Alphonse Daudet. In addition to the lectures there were practical exercises in dictation, translation, and singing, together with frequent conferences, and last, but not least, such "promenades" as that here faintly represented in its outlines. The lectures occupied the mornings from eight to ten or eleven, while the more practical work was taken in the afternoons. Five days per week were devoted to work, Sunday and Monday being holidays.

Un gueux demandait noblement l'aumône sur la route de Madrid. Un passant lui dit: "N'êtes-vous pas honteux de faire un métier aussi vil quand vous pourriez travailler?" "Monsieur," répondit le mendiant avec une fierté castillane, "c'est de l'argent et non des conseils que je demande."

Une vieille statue de Saint Maclou a été placée sous le portail de l'église de Conflans-Sainte Honorine. "Quand les gens sont vieux," me disait une paysanne, "on les met à la porte."

THE LIVING TEACHING OF LIVING LANGUAGES.

UNDER this title M. S. Barlet, whose name is well known as one of the most prominent and successful teachers of French we have, read a paper at the last monthly meeting of the College of Preceptors. We are indebted to the *Educational Times* for a full account of this most interesting and suggestive paper, throughout which there runs a note of optimism which is very consoling after the jeremiads to which we have for so many years been treated on the subject of the teaching of modern languages in England. As might be expected from him, M. Barlet puts in a powerful defence for the foreign teacher, and supports his position by arguments new and old, but all of them worth consideration. No doubt M. Barlet would admit that we get a vastly better type of foreign teacher than the sort of individual we were willing to accept twenty or thirty years back. The first native French teacher we ever came into contact with, now more than thirty years back, was a man who had certainly left his country for his own good, and possibly for his country's good. He was said to be a political refugee of '48, but his appearance was by no means prepossessing; and if he possessed any tinge of literature, he carefully concealed the fact. He spent less on soap than he did on hair-dye, and it was one of the amusements of us youngsters to notice the contrast between the glossy black where the dye had had its full effect, and the burnished copper colour of the untouched portions. But we have changed all that, and we have now as teachers of their mother tongue men who are in every way well equipped for their task. Modern languages now occupy an assured place in the curriculum of all schools above the grade of elementary, but the problem to be solved is that of making the teaching as effective as possible. M. Barlet accepts as an axiom that whatever other reason, literary or commercial, there be for learning a living language, the pupil should learn to speak it. Formerly the cultivation of the power to speak a modern language was postponed to the end of the student's course. M. Barlet, as an exponent of the direct method, would begin with speech and end with grammar. In favour of the direct method, there are strong arguments derived equally from psychological considerations and from experience. To carry it out successfully small classes are requisite, and every help that can be afforded by pictorial illustration should be given. In the schools best equipped for the teaching of modern languages, as at Harrow, there are classrooms so fitted up as to transport the pupil for a time into foreign surroundings. Here there is every inducement to him to think and to speak in a foreign tongue. But all these helps are in importance as nothing compared with the question of the teacher. M. Barlet demands much from the teacher. The vernacular of the tongue he is to teach should be thoroughly familiar to him—that is, he should be a native teacher, and he should be physically well endowed to stand the continual strain of talk. Native teacher though he be, he will find it necessary to spend his holidays at home, in order to keep up his fluency of speech and correctness of pronunciation. If Hamerton (or was it Sweet?) reckoned that one could not learn to speak a foreign language as it should be spoken under less than five years' constant practice in speaking it, how can the English form master, who takes a holiday course abroad once a year, hope to be able to carry out in all its thoroughness the direct method of teaching a foreign language? M. Barlet wound up a very useful paper by the suggestion that the College of Preceptors should issue a certificate of aptitude for teaching modern languages, and that without such a diploma no one should be allowed to teach that special branch of studies.

Un pompiere arriva trafelato—sul posto dell' incendio quando esso è già quasi spento. "Sto così lontano!" dice al comandante che lo rimprovera.

"Calliva scusa," ribatte questo; "cambiate subito alloggio in modo di trovarvi un' altra volta più vicino."

THE LONDON MATRICULATION FRENCH PAPER.

I. TRANSLATE into English :—

A.

C'est là, dans cette plantation de la Martinique, que Joséphine vint au monde, là qu'elle passa toute son enfance. Les commencements de sa vie furent heureux et tranquilles. Entourée de son père, de sa mère, de ses deux sœurs, elle reçut l'éducation patriarcale et religieuse des créoles. Elle vivait surtout en plein air, étudiant peu, parce qu'elle appartenait à une famille où l'on préférait une femme bonne et utile à une femme savante. Son père, comme les riches habitants de l'île, était un véritable souverain dans son domaine. Gentilhomme agriculteur, il ne marchait jamais que l'épée au côté et la canne à la main. L'habitation ressemblait à une monarchie absolue, mais cet absolutisme était tempéré par la douceur, par la bonté. M. Tascher de la Pagerie était un protecteur plutôt qu'un despote, et sa femme et ses filles donnaient à ses esclaves des soins de sœurs de charité. De bonne heure, Joséphine apprit de ses parents la joie qu'on trouve à faire le bien. Comme la plupart des créoles, elle avait le goût de la nature, des fleurs, de la musique. Elle aimait à regarder le ciel, à écouter le bruit des vagues, à rêver dans ces nuits radieuses des Antilles, où la lune brille comme un soleil, à chanter les airs du pays en s'accompagnant de la guitare. L'habitation des Trois-Ilets était beaucoup plus belle alors qu'elle ne l'est aujourd'hui. Là où poussent maintenant des plantes parasites, s'étendaient de riches plantations. Devant la maison était une grande place plantée de tamarins. Un parterre de fleurs magnifiques embellissait le seuil de la demeure et les toits étaient ombragés par des arbres gigantesques et séculaires. C'est là qu'au milieu des bananiers et des orangers, des fleurs tropicales et des oiseaux de paradis, avec un cortège de jeunes négresses, apparaissait la jeune enfant créole aux cheveux châtain clair, à l'œil bleu foncé, vêtue d'une robe de mousseline blanche et coiffée gracieusement du madras de soie aux couleurs éclatantes.

B.

LE LIERRE ET LE CHENE.

(THE IVY AND THE OAK.)

Autour d'un chêne séculaire
Au feuillage majestueux,
Une jeune tige de lierre
Montait en festons gracieux.

Liée à la robuste écorce,
Aux rameaux de l'arbre géant,
Sa faiblesse, changée en force,
Bravait tout les assauts du vent.

Mais un jour, triste conseillère,
La voix de l'orgueil s'éveilla :
—Je suis bien bon, se dit le lierre,
De rester assujetti là !

Qu'ai-je besoin de ce vieux chêne !
C'est lui qui retient mon essor !
Soyons libre, brisons ma chaine :
Être libre c'est être fort !

Sans délibérer davantage,
Le lierre a quitté son appui.
Hélas ! deux jours après l'orage
L'avait balayé devant lui.

These passages are fairly easy to translate, but the following points may be commented on :—

Vint au monde = was born.

Vécait surtout en plein air = she used to spend much time in the open air.

Il ne marchait.....main = he never walked about without his sword at his side and his walking-stick in his hand.

De bonne heure = at an early age.

La joie qu'on trouve à faire le bien = the joy one finds in doing good, or the joy that is experienced in doing good.

Qu'elle ne *l'est aujourd'hui* = than it is at the present day. Do not translate *ne*, but remember that in French a sentence which depends on a comparative requires this particle.

Là où.....parasites = in the place where parasitical plants are now growing.

La jeune enfant.....foncé = the young creole child with the bright auburn hair, with the deep blue eye. Notice the use of *aux* in forming the complement of a noun ; and notice that, as a rule, names of coloured objects used as adjectives are invariable, as are other adjectives of colour when limited—for example, *des yeux bleus*, but *des yeux bleu foncé*.

Séculaire. Do not translate by "secular," which in English —except among astronomers—is used in opposition to "sacred" or "religious." The French word is used in its literal signification of having lasted through centuries or ages.

Bien bon, very simple. Compare *bonhomme*.

Qu'ai-je besoin, what need have I !

II. Either (*a*) translate into French :—

Robert Moffat, who left England in October 1816, was destined to work in the northern deserts, beyond the colonial frontier, at Kuruman. He was detained at Capetown, and while there occupied himself with learning Dutch. This knowledge was afterwards useful when he went through the colony to the interior.

One scene—which is described in his life, written by his son, Mr. John Moffat—is instructive, as giving us additional evidence of the attitude of the Dutch farmers towards the coloured people. He was hospitably entertained in a Boer farmhouse. Supper ended, the table was cleared, the big Bible and psalm-books were brought out, and the family seated.

"But where are the servants?" asked Moffat.

"Servants! What do you mean?"

"I mean the Hottentots, of whom I see so many on your farm."

"Hottentots! Do you mean that? Then let us go to the mountains and call the baboons, if you want a congregation of that sort. Or, stop! I have it!—My sons, call the dogs that lie in front of the door ; they will do."

Thereupon Moffat selected as his text : "Even the dogs eat of the crumbs—"

The old Boer was so much moved that he rose and summoned the despised Hottentots. Afterwards he said to Moffat,—

"My friend, you took a hard hammer, and you have broken a hard head."

Or (*b*) write in French an essay of about twenty lines (that is, about two hundred words) on *one* of the following subjects :—Socrates, Julius Cæsar, Chaucer, Pope, Macaulay, Edward the Seventh.

The passage may be thus translated :—

Robert Moffat, qui quitta l'Angleterre en octobre 1816, fut destiné à travailler dans les déserts du nord, à Kuruman, au delà de la frontière coloniale. Il était obligé de rester à Capetown, et pendant qu'il y était, il s'occupa à étudier l'hollandais. Cette science lui était utile plus tard, quand il traversa la colonie pour arriver à l'intérieur.

Une scène—racontée dans sa biographie écrite par son fils, M. John Moffat—est instructive, parce qu'elle nous donne des preuves supplémentaires de l'attitude des fermiers hollandais envers les nègres. Il était reçu avec de l'hospitalité à une ferme boère. Le souper fini, on desservit la table et apporta la grosse Bible et les livres de psaumes, et la famille s'assit.

"Mais où sont les serviteurs?" demanda Moffat.

"Les serviteurs! Que voulez-vous dire?"

"Je veux dire les Hottentots, dont je vois beaucoup dans votre ferme."

"Les Hottentots! Vous voulez dire cela? Eh bien! Allons dans les montagnes chercher les babouins, si vous voulez un auditoire de cette sorte. Mais, attendez! j'ai trouvé le moyen! Mes fils, appelez les chiens qui se couchent devant la porte ; ils vous serviront."

Là-dessus Moffat choisit pour son texte: "Même les chiens mangent les miettes—"

Le vieux Boër fut touché à un tel point qu'il se leva, et appela les Hottentots méprisés. Il dit après à Moffat,—

"Mon ami, vous vous êtes servi d'un dur marteau et vous avez brisé une dure tête."

III. Grammar:—

1. Write in two columns (*a*) the second person singular, (*b*) the second person plural, of the indicative present of *tenir, faire, connaître, pouvoir, s'appuyer.* (These verbs are given in the grammar book.)

2. Give in two columns (*a*) the masculine plural of *religieuse, belle, grande, négresse, blanche, celle-ci, bleu;* (*b*) the feminine plural of *plein, heureux, l'un.*

(*a*)	(*b*)
religieux.	*pleines.*
beaux.	*heureuses.*
grands.	*les unes.*
nègres (note the accent).	
blancs.	
ceux-ci.	
bleus.	

3. Answer in French the following:—

(*a*) Qu'est-ce qu'une île?

(*b*) Qu'est-ce qu'un détroit?

(*c*) Nommez les jours de la semaine et les saisons de l'année.

(*a*) Une île est une terre entourée d'eau de tous côtés; comme l'Ile de Wight, Madagascar.

(*b*) Un détroit est un bras de mer resserré entre deux terres; comme le Pas de Calais.

(*c*) Dimanche, lundi, mardi, mercredi, jeudi, vendredi, samedi; janvier, fevrier, mars, avril, mai, juin, juillet, août, septembre, octobre, novembre, decembre.

4. Translate into French:—

(*a*) Where were you yesterday and the day before?—I was in the country.

(*b*) Do you like to go to the theatre in the summer?—I do not, because I am fond of fresh air.

(*c*) What do you intend doing when the examination is over?—I cannot tell you yet.

(*d*) Do you think you will get through?—I hope so.

(*a*) Où étiez-vous hier et avant-hier?—J'étais à la campagne.

(*b*) Trouvez-vous bon d'aller au théâtre l'été?—Non, parce que j'aime le plein air.

(*c*) Qu'est-ce que vous avez l'intention de faire quand l'examen sera fini?—Je ne puis pas encore vous le dire.

(*d*) Croyez-vous que vous aller passer?—J'espère qu'oui.

5. Translate into French:—

(*a*) What do you want?—I want you to come with me.

(*b*) I thought you knew that he had left London.

(*c*) I have not the slightest idea how to translate that.—It is not difficult.

(*d*) Those who arrive there first will order lunch.

(*a*) Que voulez-vous?—Je veux que vous veniez avec moi.

(*b*) Je croyais que vous sachiez qu'il était parti de Londres.

(*c*) Je n'ai pas la moindre idée de la manière de traduire cela (*or* comment cela se traduit).—Ce n'est pas difficile.

(*d*) Ceux qui arriveront les premiers commanderont le gouter (*or* le lunch).

6. Translate into French:—

(*a*) This book is as difficult as the other.

(*b*) Who were the gentleman and lady who were talking with you last night?

(*c*) Her brother told me that John and his sister were going away to-morrow.

(*d*) I was present when he gave his watch to your nephew.—Oh, were you?

(*a*) Ce livre est aussi difficile que l'autre.

(*b*) Qui étaient le monsieur et la dame qui causaient avec vous hier soir?

(*c*) Son frère m'a dit que Jean et sa sœur allaient partir demain.

(*d*) J'étais présent quand il donna sa montre à votre neveu.—O, vraiment?

DIFFICULTIES OF FRENCH IDIOMS AND CONSTRUCTIONS.

II.

User in the sense of "to use" is followed by *de;* as, *Usez du peu que nous avons.* "To use" is more often translated by *se servir de* or *employer.* As a transitive verb *user* means "to wear out;" as, *Un tapis tout usé couvrit deux escabelles.*

Misconceptions may also arise in connection with the use and translation of nouns. Thus:—

Accomplissement is not an "accomplishment" in an artistic or social sense. In this sense we should talk of a *talent d'agrément,* or *art d'agrément.* In French, *accomplissement* is merely the "act of accomplishing;" as, *Une chose qui a été l'accomplissement de ma gloire.*

Acte is not an "action," which in modern French would be *action.* It may mean, as in English, an act of a play; and it is used in such phrases as *faire acte de présence,* which means "to show oneself," or *prendre acte de* (*quelque chose*), meaning "that one notes a thing for further use," or a legal deed.

Assistance, as already mentioned, means "the audience," and *les assistants* "the bystanders." "Assistance" in the English sense is usually translated by *secours.*

Attente means not "attempt," but the action of waiting or expecting; as, *L'événement a trompé son attente; passer plusieurs jours dans une attente pénible.* "Attempt" is *tentative;* and in the sense of an attempt on some one's life, *attentat.*

Avertissement is not "advertisement," but "warning;" as, *Il ferme l'oreille à tous les avertissements.* "Advertisement" is *annonce* or *réclame.*

Bachelier is only "bachelor" in an academic sense; as, *Bachelier-ès-lettres,* Bachelor of Arts. "*Un bachelier est un homme qui apprend, et un docteur un homme qui oublie,*" is a satirical observation of a French author. In the sense of "a single man," the French word to use is *garçon.*

Barbe is used not only to denote the beard, strictly so called, but also to denote all the hirsute adornments of the masculine visage. *Faire la barbe* means "to shave."

Bonnet does not mean a "bonnet," but, as in the Scotch usage, a "cap." "Bonnet" is *chapeau.*

Banqueroute means "bankruptcy," but only when arising from fraud or criminal negligence. "Bankruptcy" due to simple misfortune is *faillite.*

Baraque is not a "barrack," but a badly-built house or hovel. In a military sense, "barrack" is *caserne.*

Boulet is not a "bullet," but a cannon ball. A "bullet" is in French *balle.*

Chandelle is commonly used of a tallow candle. A wax candle is *bougie.*

Cloche is "bell," not "clock," for which the word is *horloge* or *pendule.*

Col, collet, and *collier* are words very likely to be confounded in their usage. The first is used to denote the collar of a shirt; *faux-col* is applied to a detachable collar, usually a turned-down collar. *Collet* is applied to the collar of a coat. *Collier* is a collar of gold worn by knights of certain orders, and a horse-collar.

Chimiste is not a "chemist" in the sense of a man who sells drugs. The French word in this sense is *pharmacien. Chimiste* is a man who makes a study of the science of chemistry.

Curé is not "curate," which with us commonly means a subordinate clergyman of a parish. On the other hand, it means the chief priest of a parish. Any other priest is a *vicaire,* the word being thus used in its proper Latin sense of one who takes the place of another.

Défense means not only "defence," but "prohibition." Hence the inscription one so often sees on walls in French towns, "*Défense d'afficher.*"

Envie is not only "envy," but "desire." For example:

Je n'ai pas grande envie
De vous sacrifier le repos de ma vie.

Do not confound this word with the substantive *envi,*

which is used only in the single phrase of *a l'envi* (*de*), "in rivalry with:" *L'imagination rend les fous heureux à l'envi de la raison.*

Equipage generally means the "crew of a vessel."

Face is commonly "front," and not the human face. Thus, *en face de* is "in front of" or "opposite." The human face is generally translated by *figure*. For example: *Sa figure ne m'est pas inconnue.*

Faction is "sentry-go," and not "faction." *Etre en faction* means "to be on sentry."

Front is "forehead," rather than "front" in our sense of the word. Thus, *Il a donné du front contre la porte.*

Gentil is not "gentle," which one should rather translate by *doux*, but "nice" or "pretty."

Gentilhomme is not "gentleman" in our sense, but a man of noble birth. For example:

Qui se dit gentilhomme, et ment comme tu fais,
Il ment quand il le dit.

Glace is not "glass" in the ordinary sense, but a glass which reflects. It also means "ice." Ordinary window or drinking glass is *verre*.

N.B.—We have not translated the sentences used as illustrations. If any of the sentences present difficulties, write to "EDITOR, *Practical Teacher*," enclosing the coupon of the current number, and marking your envelope outside, "Modern Language Section." *A stamped addressed envelope must be sent for reply.*

ON FRENCH VERSIFICATION.

I.

AS we have been appealed to by some of our readers to explain difficulties connected with French verse, we thought that a simple explanation of the system of versification in French might be of assistance to students.

We shall deal first with the syllabification of poetry as compared with that of prose.

Theoretically a word contains a number of syllables equal to the number of elements, each containing one vowel or diphthong, into which it can be divided. By a diphthong we do not, of course, mean merely a collocation of two vowels, but a single sound expressed by two vowels following each other. Thus *ai* in *haïr* do not form a diphthong, but *ai* in *ai-mer* do. From the above it follows that a final *e* mute (that is, unaccented) helps, as in *ai me*, to build up a separate syllable. This is so, but in conversation this syllable has no value, and is not sounded. The case is different in poetry, where it is always sounded, except that—

(*a*) A final *e* mute is elided before a word beginning with a vowel or *h* mute. If, however, *e* is followed by *s* or *nt* it is sounded. The two couplets quoted below illustrate the whole of this rule.

"Si la souf|france et la pri|ère
N'atteign|ent pas ta majesté,
Gar|de ta grandeur solitaire
Ferme à jamais l'immensité."

"Mais si nos an|gois|ses mor|tel|les
Jusqu'à toi peuv|ent parvenir,
Si dans les plai|nes é|ter|nel|les
Parfois tu nous entends gémir."

The mute *e* in *souffrance* is not sounded, as the next word is *et*, but it is sounded in the final syllables of *atteignent*, *angoisses*, *plaines*.

(*b*) *E* mute at the end of a line is not sounded. Hence *prière* contains but two and *solitaire* but three syllables.

(*c*) A final *e* mute followed by *s* or *nt*, or by a word commencing with a consonant or aspirate *h*, forms a separate syllable, and is slightly pronounced. Thus

"D'un point de l'horizon, com|me des mas|ses bru|nes
Ils viennent,"

illustrates the syllabic *es*. This is also illustrated by *mortelles* and *éternelles* in the previous extract.

"Aussi, pleins de courage et de lenteur, ils pass|ent
Comme u|ne li|gne noire,"

illustrates the syllabic *ent*; whilst

"Quel|le hon|te pour moi, quel tri|om|phe pour lui,"

shows how *quelle* before the aspirated *honte* is a two-syllable word, and *honte* and *triomphe* before *pour* have, respectively, two and three syllables.

(*d*) A word ending with the combination of a vowel and an *e* mute (for example, *ie*) can only occur at the end of a line, or in a position where, according to (*a*), the *e* would be elided.

"Sans chercher, sans se déranger
Ils avaient la ta|ble s:rvie
De quoi boire et de quoi manger
Tout leur soûl et tou|te leur vie."

Servie and *vie* both come at the end of a line. Disregarding the question of the rhyme, the last line, so far as the metre is concerned, could equally well be written—

"Tou|te leur vie et tout leur soûl."

Rhyme is indispensable to modern French verse. Blank verse is therefore altogether foreign to the genius of the French language. In the earliest times, rhyme in French poetry was merely assonant—that is, there was merely a similarity in the sound of the final vowels. For example—

"La dame fu el bois, qui durement plora
S'oï les leus aller, et li huans hua:
Il esclaire forment et roidement tonna
Et pluet menuëment et gresille et venta."

This can be easily understood with a very few explanations. *Fu el bois* = *fut au bois*; *plora* = *pleura*. The second line means, "One heard the wolves bay and the bat screech." *Il esclaire forment* = It lightened frequently. *Pluet menuëment* = *plut* (from *pleuvoir*) *souvent*.

In time, however, the final syllables were made consonant as well as assonant—that is, the final vowel sounds were not merely identical, but they were followed by like consonant sounds, as in—

"Et près d'el|les, toujours, le mal qui me torture,
L'ennui—som|bre veilleur—dans la ma|re s'endort;
Et, ravi, je savoure une ode à la nature
Dans l'hum|ble fixité de leurs yeux cerclés d'or."

But in order to make a more telling and fuller rhyme, French poets go farther still. The rhyme is supported, as far as possible, by what is called a supporting consonant (*consonne d'appui*). In other words, there is an identity of consonantal sound not only *after* but *before* the assonant vowel. In—

"Ces rep|ti|les mignons qui sont, malgré leur forme,
Poissons dans les marais, et sur la terre oiseaux,
Sau|til|lent à mes pieds, que j'erre ou que je dorme,
Sur le bord de l'étang troué par leurs museaux,"

both the rhymes are supported.

We shall take up this subject again in our next issue. Meanwhile our readers should apply the rules we have given for division into syllables to as much French poetry as possible, and also notice for themselves how the principles of consonant and supported rhymes can be illustrated from what they read. It will be noticed that, as a help to readers, we have marked every case where what would be a mute *e* in conversation helps to form a separate syllable in poetry.

AMOUR FRATERNEL.—J'avais un frère plus âgé que moi de sept ans. Il apprenait la profession de mon père, qui était horloger à Genève. L'extrême affection qu'on avait pour moi le faisait un peu négliger. Je ne le voyais presque point; mais je ne l'en aimais pas moins tendrement. Je me souviens qu'une fois que mon père le châtiait rudement, je me jetai entre eux et je pris mon frère dans mes bras. Je le couvris ainsi de mon corps, recevant les coups qui lui étaient portés, et je m'obstinais si bien dans cette attitude qu'il fallut enfin que mon père lui fît grâce. J. J. ROUSSEAU.

FRENCH PRIZE COMPETITION.

RULES.

1. All translations should be **posted not later than November 8**, and addressed:—PRIZE EDITOR, Office of the *Practical Teacher*, 35 and 36 Paternoster Row, London, E.C.
2. Competitors should cut out and send the Coupon which appears on the Back Wrapper page of the current number.

ALTERATION IN RULE 3.

3. Competitors should write pseudonym only on MS. Prize-winner will be asked to send name and address for publication.
4. No competitor may take the prize offered more than once in three months.

A Prize of Half a Guinea is offered for the best rendering into English of the following extract:—

Mais en sus de ces habitués dont la psychologie est enfantine et dont la culture d'esprit est nulle, il en est d'autres sur lesquels l'influence despotique du café agit; des habitués riches ou de vie large, célibataires invaincus sans ménage à fuir, gens sobres exécrant le jeu, ne parlant point, lisant les journaux à peine. Ceux-là sont les amateurs désintéressés, les habitués qui aiment le café, en dehors de toute préoccupation, en dehors de tout profit, pour lui-même. Cette clientèle se recrute parmi de vieilles gens, surtout parmi des savants et des artistes, voire même parmi des prêtres. Forcément les excentriques et les maniaques abondent dans cette petite caste d'individus réunis et s'isolant dans une passion unique. A les observer, ces habitués se regardent en dessous, sans désir de se connaître, mais ils ont la provisoire bienveillance des complices. Chacun d'eux a adopté une place qu'il ne quitte plus, et, d'un tacite accord, tous s'asseoient devant leur table d'élection, se passent la carafe d'eau frappée et les journaux, et se saluent en souriant, puis se griment d'une mine rêche comme pour prévenir des appâts de politesse et des avances. Involontairement, ils regardent la pendule, constatent que le voisin d'ordinaire si exact est en retard, éprouvent un certain soulagement quand il arrive, une vague appréhension s'il n'arrive pas. Ils s'y intéressent presque, non pour sa personne même, mais pour la place qu'elle occupe auprès d'eux, pour sa figure dont l'absence les contrarie, pour l'accessoire qu'elle est dans ce café dont le milieu fait de mille détails se désagrège si l'un d'eux se modifie ou manque. J. K. HUYSMANS.

RESULTS OF THE OCTOBER COMPETITION.

The prize is awarded to "Exile," the pseudonym of Mrs. A. E. Duchesne, 32 Hornby Road, Bombay, India.

First Class.—Mot, Dewhurst, Agaznog, Rustica, Arethusa, Hyacinthus, C.E.M., Ymp, J.E.C., Babette, Adlitam, Amry, Ferolo, Cynthia, Lorine, Day Dawn, Sapientia, Alexis, Natalis, Ecila, Sanders, La Printanière, Dominie, Kelso, Osaka, Humbie, Argus, Nick, E.A.C., Fiscal, E.W., Bees, The Muir, Eboracum, Chêne, Trevena, Annie Laurie, Sobriquet, Jadie, Rose, Automobile, Wee Macgregor, Tintagel, Nothing venture, Brushwork, Noipmac, Trellis, Gladiola, Gallia, Lover of Amiel.

Second Class.—Jocaste, Welburn, Medusa, Jopedi III., Damaris, Me, Portignon, Espérance (Walthamstow), White Rose, Dereel, Portia, Aim, Anglo-Franco, J.B.W.S., Royal Hibernian, Janet, Gipsy, Isis, Clip, Bam, Bertrand Guesclin, L'anglais, Rose-plot, Bo'ness Knot, Rosalind, Croissant, Perseverantia, Oakwoodite, G.F.R.C., Ephesian, Emerald Isle, Malvina, Kensington, Espérance, Hope.

Third Class.—Spero, Vivre, Ley Bent, Hussar, Dorothy, Evangeline, Jessamine, Bearic.

Report.

The piece set was very interesting and suggestive, but somewhat difficult to translate. The editor's note probably led many to realise the central idea of the extract, who would not otherwise have done so; but despite the help thus given, too many translations were received which showed that competitors doggedly set about putting the piece into English as if it were a task that had to be done somehow or another. From competitors of this class I got such renderings as "even in parsing" for *même dans l'analyse*; "the slave to literature," for *la littérature slave*; "bashful exhaustion," for *honteuse défaillance*. Ignorance of the way in which a dictionary should be used accounts for "the plotting of a flower," "the dawning of a flower," and "the hatching of a flower," as translations of *l'éclosion d'une fleur*.

Prize Translation.

But is what we find set forth in writers of the pessimistic school really the whole truth? The Latin intellect, even though working by analysis, is still absolute; it has not been endowed with the sense of the relative. Despite its flexibility, it has no hesitation in making its characters entirely homogeneous; it makes them too consistent in good or evil, it works by synthetic methods, it deals in categories. The Anglo-Saxon genius is much less influenced by preconceived notions; it reveals rather than analyses human nature, and its innate reverence forbids it to expose all the nakedness of the human soul. But if it has more decency, if its characters are of a loftier type, if it upholds the *sursum corda*, and does not fall into disheartening pessimism, it lacks that wide and far-reaching understanding of the human heart which characterises the Slav genius. This last never lacks courage; it has the temerity to exhibit in the soul of a courtesan the blooming of a flower of stainless purity, and we see the murderer showing the utmost refinement of conscience. No contradiction, no complexity, appals it. The most loving and devoted natures are capable at times of harsh and violent thoughts; a life of self-denial is no safeguard against a temporary access of sinful lust or disgraceful weakness. Doubtless a profound sadness arises from this impartial survey of the weakness as well as the strength of mankind; but the assertion that no one is unworthy of being loved does not harden the heart like the analytical method of the Latin writers. Slav literature has not as its theme the hero-worship to be found in English writers, but the spark which it reveals as glowing in every soul is a proof of the lofty origin of man, and prevents the springs of love from drying up. EXILE.

UNE ORDONNANCE.—Un paysan, dont la femme était malade, fit venir le médecin. Celui-ci demanda du papier, une plume et de l'encre pour rédiger son ordonnance; mais il n'y avait rien de tout cela chez le paysan. On ne put trouver qu'un morceau de craie; le médecin le prit, écrivit son ordonnance sur la porte de la chambre et s'en alla. Le paysan, ne sachant pas lire, fut bien embarrassé, car il fallait chercher le remède prescrit chez le pharmacien de la ville; cependant, après un instant de réflexion, le brave homme qui savait se débrouiller dans les cas difficiles, enleva la porte, la chargea sur sa voiture, attela ses deux bœufs et la transporta à la pharmacie où son arrivée excita une grande gaieté.

INSTALLATION DANS MON MOULIN.—Quelqu'un de très étonné en me voyant, c'est le locataire du premier, un vieux hibou sinistre à tête de penseur qui habite le moulin depuis plus de vingt ans. Je l'ai trouvé dans la chambre du haut, immobile et droit sur l'arbre de couche, au milieu des plâtras, des tuiles tombées. Il m'a regardé un moment de son œil rond, puis, tout effaré de ne pas me reconnaître, il s'est mis à faire: "Hou! hou!" et à secouer péniblement ses ailes grises de poussière: ces diables de penseurs, ça ne se brosse jamais..... N'importe, tel qu'il est avec ses yeux clignotants et sa mine renfrognée, ce locataire silencieux me plaît encore mieux qu'un autre, et je me suis empressé de lui renouveler son bail. Il garde comme dans le passé tout le haut du moulin avec une entrée par le toit, moi je me réserve la pièce du bas, une petite pièce blanchie à la chaux, basse et voûtée comme un réfectoire de couvent. ALPHONSE DAUDET.

OUR TUTORIAL SECTION

OUR PUPIL TEACHERS' AND SCHOLARSHIP COURSE.

BY ARTHUR T. FLUX,

Principal of the Belvedere Pupil Teachers' Centre, First on Scholarship List; Author of "Scholarship School Management," "Building of the British Empire," etc.

SCHOLARSHIP COURSE FOR 1903.

Eleventh Month—November.

(*N.B.*—I should be glad if students who intend to follow this course regularly would send their names and addresses to me.)

Work for the Month.

1. *Teaching.*—As all the subjects have now been covered, it would be useful to revise the methods of teaching the usual school subjects. Some elementary knowledge of the principles of psychology is very necessary, and the chapter in the text-book on discipline should be studied.

2. *Drawing.*—Continue to work one or two exercises per week, working against time. Take care in lining-in to get smooth, flowing curves, and vary the quality of the lines to prevent a flat appearance. The main curves may be firmer than the detail of the copy.

3. *Penmanship.*—Ten minutes' daily practice from the *Practical Teacher Copy Book.*

4. *Composition.*—Write one or two essays each week on such subjects as:—

(1.) The Forest of Arden.
(2.) The character of the Duke of Marlborough.
(3.) "Birds of a feather flock together."
(4.) Aerial navigation.
(5.) The advantages and disadvantages of free libraries.
(6.) The French Revolution of 1789.
(7.) "The darkest day, wait till to-morrow, will have passed away."
(8.) "Sweet are the uses of adversity."

Read up the subjects if necessary, and arrange your ideas on a definite plan before commencing to write. This arrangement is still entirely neglected in many of the essays submitted for criticism. The following notes may assist:—

(1.) Note that the "Forest" is anywhere and everywhere; the various trees mentioned, the variety of animals; a place with little care, free from the restrictions of civilisation, so pleasant that the banished duke hesitates to leave it to enter the world of men.

(2.) *Esmond* will largely supply this, and the text-book will supplement—(*a*) His genius as a soldier; (*b*) his intrepidity and calmness; (*c*) the meanness and peculation with which he was charged.

(3.) Treat as in previous proverbs. (*a*) The truth of the literal meaning; (*b*) the wider and deeper application.

(4.) A science now much discussed. All "flying machines" have been failures. The ultimate solution seems likely to be a balloon carrying light but powerful motors. Note the great difficulty—that the air is not sufficiently dense to allow propellers to get any "push" unless they run at excessive speed.

(5.) The advantages will occur to all. The disadvantage seems to be that people will not read the right class of book; too much light reading of the society novel type is taken out, and not enough requiring serious thought.

(6.) Little comment is needed. (*a*) Causes, (*b*) events, (*c*) effects.

(7.) and (8.) The suggestion in both of these topics is obvious.

5. *English.*—

(1.) Learn twenty-five roots and meanings per week.
(2.) Revise weak points in grammar, especially definitions.
(3.) Revise notes on the growth of the language.
(4.) *The Task*, Book V. Finish to line 363.
(5.) *As You Like It.* Finish the text.

Questions for Revision of "The Task."

1. Give in your own words Cowper's description of the appearance of the country on a winter morning.
2. How does Cowper account for the rise of the office of "kings"? What can you say about his politics?
3. "Cowper's descriptions of country life are the pictures of an eye-witness." Comment on and prove this statement.
4. Cowper stands midway between the Augustan poets and the Lake school. Explain this.
5. Give some account of Cowper's more intimate friends.
6. In what metre is *The Task* written? How does the author prevent monotony in the metre?
7. What are the chief characteristics of Cowper's poetry? Quote examples to prove your statements.
8. Explain "mausolean pomp," "the Vulcan of old times," "they demi-deify and fume him so," "Jotham ascribed to his assembled trees."

Revision Questions on "As You Like It."

1. Point out and explain the grammatical peculiarities in—
(1.) "My father hath no child but I, nor none is like to have."
(2.) "An if he will come to me."
(3.) "Your bright eyne."
(4.) "Speak sad brow and true maid."
(5.) "So please you."
(6.) "Thou were best look to't."

2. Give the etymology of *carlot, character, hinds, pantaloon, purlieus, roynish, shrewd.*

3. What does Jaques say he would do in the character of a fool?

4. Explain the varieties of the "lie" as given by Touchstone, and the various paces of time as stated by Rosalind.

5. Compare the characters of Rosalind and Celia.

6. Explain:—
(1.) "Is but a quintain, a mere lifeless block."
(2.) "The toad, ugly and venomous,
Wears yet a precious jewel in his head."
(3.) "Right butter-woman's rank to market."
(4.) "Gargantua's mouth."
(5.) "A South-sea of discovery."
(6.) "Right painted cloth.'
(7.) "Diana in the fountain."
(8.) "Atalanta's heels."

7. Quote any passages of the play which have become proverbial.

8. By whom, to whom, and on what occasions were the following said?—
(1.) "How full of briers is this working-day world!"
(2.) "O good old man, how well in thee appears
The constant service of the antique world!"
(3.) "'Tis a Greek invocation."
(4.) "I pray the gods make me honest."
(5.) "Take good heart, and counterfeit to be a man."
(6.) "He uses his folly like a stalking horse."

9. Explain, with some reference to context:—
(1.) "Cupid hath clapped him on the shoulder."
(2.) "The ox hath his bow."
(3.) "Your having in beard is a younger brother's revenue."
(4.) "Out of you she sees herself more proper."
(5.) "Your coming before me is nearer to my father's reverence."

10. What references to history or fable are intended in the following passages?—
(1.) "Cæsar's thrasonical brag."
(2.) "As rare as Phœnix."
(3.) "Honest Ovid, among the Goths."
(4.) "Since Pythagoras's time, that I was an Irish rat."
(5.) "The chroniclers found it was—Hero of Sestos."

11. Note anything characteristically Shakespearian in the grammatical forms or structure of the following:—
(1.) "The inexpressive she."
(2.) "'Tis such fools as thou that makes the world full," etc.
(3.) "Thou and I am one."

12. Give any different readings of the following lines, and state which you prefer, and why :—

(1.) "The bonny priser of the humorous duke."
(2.) "O most gentle Jupiter, what tedious homily," etc.
(3.) "A motley fool, a miserable varlet!"
(4.) "Some of it is for my child's father."

6. *Geography.*—The remaining time will be spent in revision. Many students experience difficulty in revising such a wide subject. There are many ways in which this may be done. Take any country, draw a sketch-map from memory, fill in all the details you can, and then compare carefully with an atlas. This will reveal any weak points. Or take the index to a text-book, and see if you can find any names which you know nothing of. If so, look them up. Towns, imports, exports, government, should be well known, and especial attention should be given to countries with which we have considerable trade. Some revision questions will be given next month.

7. *History.*—Victoria, and general revision.

Chief points :—

The Chartist agitation, penny postage, repeal of corn laws, Great Exhibition, Crimean War, Indian Mutiny, great development in trade and wealth; inventions, etc., of the nineteenth century, etc.

In revision, it is well, supposing the main facts are well known, to take up chains of events; for example :—

The Church.—Augustine; Scottish missionaries; Dunstan; changes at the Conquest; Lanfranc; Anselm; the investiture dispute; Constitutions of Clarendon; John's quarrel with the Pope; Mortmain; *Præmunire;* Provisors; *De Heretico comburendo;* Lollards; Reformation; Puritans; Clarendon Code; Toleration Acts; Queen Anne's bounty; Catholic emancipation.

The Parliament.—Witenagemote (constitution and powers); *Magnum Concilium; Curia Regis;* De Montfort's Parliament; advance under Lancastrians stopped by Act of 1430; Whigs and Tories, Revolution of 1689 and consequent changes (government by party and Cabinet, etc.); the agitation for reform; Reform Bills.

Important statutes, colonial development, rise of the army and navy, important treaties, etc.

This method covers the ground in a new fashion.

8. *Arithmetic.*—Revise generally. Pay especial attention to all the theory, especially proof by casting out nines; theory of G.C.M. and L.C.M.; kinds of fractions; decimals; recurring decimals, and the fractions which produce them (if the denominator of a fraction in its lowest terms contains no other prime factor than 2 and 5, it may be represented by a finite decimal, and not otherwise); proof of the rule for converting a recurring decimal to a vulgar fraction; ratio and proportion. Exact definitions of all terms employed must be committed to memory.

9. *Algebra.*—Revise generally, especially the various proofs.

10. *Euclid.*—Revise Book II., with ten deductions per week.

11. *Science.*—General revision. A set of questions will be given next month for final revision.

12. *General Information.*—Work through several papers in the text-book.

Notes on the September Paper.

1. The use of the lightning conductor was correctly stated in most cases. Some few students found a difficulty in locating a very safe place. A building protected by a lightning conductor is quite safe.

2. Generally well done. Enough stress was not laid on the fact that the heat in both cases is produced by the chemical union of the same two elements—carbon and oxygen.

3. The completed quotations and sources are :—

(1.) "Sweet are the uses of adversity."—*As You Like It.*
(2.) "A thing of beauty is a joy for ever."—Keats's *Endymion.*
(3.) "The rank is but the guinea stamp;
A man's a man for a' that."—Burns.
(4.) "Oh that those lips had language," etc.—Cowper, *On the Receipt of My Mother's Picture.*
(5.) "And God fulfils Himself in many ways,
Lest one good custom should corrupt the world."—Tennyson's *Passing of Arthur.*
(6.) "Tell me not in mournful numbers
Life is but an empty dream."—Longfellow's *Psalm of Life.*
(7.) "The paths of glory lead but to the grave."—Gray's *Elegy.*
(8.) "A little knowledge is a dangerous thing."—Pope's *Essay on Criticism.*

4. Generally correct.

5. The "Greek Calends" means "never." There were no calends in the Greek calendar.

6. Generally correct. The Blue Grotto in the Bay of Naples was not known to some, and several confused the Bois de Boulogne (the great park near Paris) with the Avenue du Bois de Boulogne, the fashionable drive leading to it.

7. Fairly well done. There is scarcely an animal which is not particularly suited to its surroundings, if its peculiarities are thought out.

8. Generally correct.

Test Questions on General Information.

The answers to these questions are marked gratis. They should be written on foolscap, and on one side only; the coupon of the present number and a stamped addressed envelope must be enclosed. All papers must be sent direct to Mr. A. T. Flux, Oakleigh, Belvedere, Kent. A prize of one guinea will be given to the student securing the highest percentage of marks on the course.

1. Explain the phenomenon of the Midnight Sun. How long does summer last at the North Pole?

2. What is a glacier? How is it formed? Describe an experiment to prove that the middle moves faster than the sides.

3. "The streams are useful for power, but not for navigation." What does this mean? To what countries might it refer?

4. Where and what are the Yellowstone Park, the Cow's Mouth, Chesil Bank, the Granite City, the Venice of the North, Somerset House?

5. Explain the use of the following :—
(1.) Verbum sat. sap.
(2.) Fidus Achates.
(3.) Coup d'état.
(4.) Nom de plume.
(5.) Ci-git.
(6.) Noblesse oblige.
(7.) L'état c'est moi.

6. Who wrote the following?—*Advancement of Learning, Romeo and Juliet, Sartor Resartus, Les Misérables, The Rose and the Ring, The Deserted Village, Rasselas, Lalla Rookh.* State approximately when the author lived.

7. Who said,—
(1.) "When found, make a note of."
(2.) "But that's another story."
(3.) "A Daniel come to judgment."
(4.) "Call me early."
(5.) "The day will come when you shall hear me."
(6.) "Give me back my legions."
(7.) "Veni, vidi, vici."

8. How is a rainbow formed, and under what conditions?

In place of the usual test questions, some test papers are given. These should be worked under examination conditions. If desired, they will be marked if forwarded to Mr. A. T. Flux, Oakleigh, Belvedere, Kent, with a fee of half a crown.

Music.

(Half an hour. Answer *five* questions.)

1. Write the following in the staff notation :—

Key B♭

$$\left\{\begin{array}{l} :\mathbf{s}_1 \,|\, \mathbf{s}_1 : \mathbf{m}_1 : \mathbf{s}_1 \,|\, \mathbf{d} : - : \mathbf{r} \,|\, \mathbf{m} : - : \mathbf{f} \,|\, \mathbf{s} : - : \mathbf{d} \,|\, \mathbf{f} : - : \mathbf{d} \,|\, \mathbf{f} : - : \mathbf{l} \,|\, \mathbf{s} : - : - \,|\, - : - \,\| \\ :\mathbf{s}_1 \,|\, \mathbf{s}_1 : \mathbf{m}_1 : \mathbf{s}_1 \,|\, \mathbf{d} : - : \mathbf{t}_1 \,|\, \mathbf{d} : - : \mathbf{r} \,|\, \mathbf{m} : - : \mathbf{d} \,|\, \mathbf{l}_1 : - : \mathbf{l}_1 \,|\, \mathbf{l}_1 : - : \mathbf{f} \,|\, \mathbf{m} : - : - \,|\, - : - \,\| \end{array}\right.$$

2. Rewrite the following in four-pulse measure, doubling the value of each note and rest :—

$$|\, \mathbf{s}_1 . \mathbf{f} : \mathbf{m} . \mathbf{d} \,|\, \mathbf{r} : - . \mathbf{m} \,|\, \mathbf{f}_1 . \mathbf{s}_1 . \mathbf{l}_1 : \mathbf{t}_1 . \mathbf{d}' . \mathbf{s} \,|\, \mathbf{m} . : . \mathbf{f} \,|\, \mathbf{m} . \mathbf{r} . \mathbf{d} : \mathbf{r} . \mathbf{d} \,|\, \mathbf{d} : - \,\|$$

3. Which of the following notes is highest in pitch, and which lowest?—

t, in Key C, **l**, in Key B♭, **m**, in Key A♭, **r**, in Key D, **f** in Key B.

Show each note in position on the treble stave.

4. Name the intervals formed by each of the following notes with each of the others :—**r bah se t**

5. Rewrite the following passages on the perfect method :—
(1.) **l ta s f d' ta s m d' r' ta l s m f.**
(2.) **r s fe l r d t, fe s l fe r m fe s.**

6. Give meaning of following terms :—(1) A tempo, (2) Ad libitum, (3) Adagio, (4) Dal segno, (5) Grazioso, (6) Calando.

Penmanship.

(Ten minutes.)

Write as specimen of copy-setting :—

Large Hand.—*Bibliography.*
Small Hand.—*Ring out, wild bells, to the wild sky,*
The flying cloud, the frosty night.

Composition.

(Forty minutes.)

Write an essay of 30 to 40 lines on one of the following topics:—

(1.) The uses of nature study.

(2.) The character of one of the *dramatis personæ* in *As You Like It*.

(3.) Life in the times of Esmond.

Dictation.

(Thirty minutes.)

Write the following passage from dictation; the piece should be read through once previously to dictation:—

It would be amusing | to take a digest | of the irrational laws | which bad critics | have framed | for the government of poets. | First in celebrity | and in absurdity | stand the dramatic unities | of place and time. | No human being | has ever been able | to find anything | that could | even by courtesy | be called an argument | for these unities | except that they have been deduced | from the general practice | of the Greeks. | It requires | no very profound examination | to discover | that the Greek dramas | often admirable as compositions | are, as exhibitions of human character and human life, | far inferior to the English plays | of the age of Elizabeth. | All the greatest masterpieces | of the dramatic art | have been composed | in direct violation of the unities | and could never have been composed | if the unities | had not been violated.

English.

(Two hours. Answer Question 1, and either Question 2 *or* 3. You may answer *five* others, one of which, at least, must be taken from each of the Sections 2, 3, and 4.)

Section 1.

1. Analyse *one* of the following passages, and parse the words in italics in the passage chosen:—

(1.) "*Strange* that *such* folly *as* lifts bloated man
To eminence fit *only* for a god,
Should ever drivel out of human lips,
Even in the cradled weakness of the world."

(2.) "What, wouldst thou have me go and beg my food,
Or with a base and boisterous sword enforce
A thievish living on the common road?
This I must do, or know not what to do."

2. Write short notes of a lesson on comparison of adjectives, or the uses of the infinitive.

3. How can you generally tell whether a word is of English (Anglo-Saxon) origin?

4. Construct sentences to show the difference in meaning between the following words, and point out in each case the force of the prefix:—*Deface—efface, absolve—dissolve, depose—oppose, apathy—antipathy, subvert—convert, aspire—inspire.*

Section 2.

A. "*As You Like It.*"

1. From what source did Shakespeare derive the plot of this play? Give a brief sketch of the plot.

2. By whom, to whom, and on what occasions were the following lines spoken?—

(1.) "Sweep on, you fat and greasy citizens."

(2.) "He dies that touches any of this fruit."

(3.) "'Tis a Greek invocation to call fools into a circle."

(4.) "Omittance is no quittance."

(5.) "A wretched, ragged man overgrown with hair
Lay sleeping on his back."

(6.) "In respect that it is a shepherd's life it is naught."

3. Explain the following allusions:—

(1.) "Good wine needs no bush."

(2.) "Dead shepherd, now I find thy saw of might:
Who ever loved that loved not at first sight?"

(3.) "Thrice-crowned queen of night."

(4.) "Helen's cheek, but not her heart."

(5.) "I will scarce think you have swam in a gondola."

B. "*The Task.*"

1. Give in your own words a description of the ice palace.

2. Explain the phrases:—"To wield the axe and drive the wedge;" "pillars of pellucid length;" "Aristæus found Cyrene;" "all was vitreous;" "pyramids;" "when Babel was confounded;" "prickly grievance."

3. Give the substance of Cowper's remarks about freedom.

Section 3.

1. Narrate one of the exploits of Perseus.

2. What happened to the Argonauts after they had obtained the Golden Fleece?

Section 4.

1. Write a character of Beatrice, or of her mother.

2. Explain the part which Esmond took in the duel, and give the results of it.

Geography.

(One hour and a half. Answer *six* questions.)

1. The difference between the summer heat and the winter cold of Moscow is 82°, whilst that of London is 57°. How do you account for this? Mention, with instances, the chief causes which determine the climate of a country.

2. What bearing has the geographical position of Great Britain had upon the national character, its relations with foreign countries, discoveries, and commerce?

3. To what part of the British Isles would you go to see the Broads, the Fens, bogs, tors, forests, a rockbound coast, and the "white cliffs of Albion"?

4. Where and what are *eight* of the following?—Bornholm, Milo, Dalmatia, Bremen, St. Gothard, Dunkirk, Milan, Tyrol, Brindisi, Palermo, and Abo.

5. Describe any recent railway developments in Asiatic Russia.

6. Describe the forms of government existing in any *two* of our most important colonies.

7. From which of our colonies do we obtain (1) raw materials for textile fabrics, (2) precious minerals and stones, (3) articles of food? What do we send out in return?

8. "It is thought, for the security of the empire, that we should maintain certain ports, harbours, coaling stations, and 'places of arms' at considerable cost." Name some of these, and mention their special uses.

9. Write what you know about *six* of the following:—New Westminster, Rangoon, Kimberley, Toronto, Penang, Athabasca, Bathurst, Socotra, Pegu.

10. In what parts of the empire do we find Ghoorkhas, Veddahs, Zulus, Tamils, Kaffirs, Maoris, Malays, and Chinese? Give their distinguishing characteristics.

11. How would you give a lesson on the Uses of the Colonies?

History.

(One hour and a half. Answer *four* questions.)

1. In what way did the feudal system supply the military requirements of the country? What causes led to the adoption of other methods of providing armies?

2. Give a short account of the Parliaments known respectively as the Mad, the Good, the Wonderful, the Short.

3. In the Middle Ages resistance was an ordinary remedy for political distempers. Give instances of this from English history.

4. Mention any steps taken by Norman or Plantagenet kings to check the power of the Church.

5. Between what parties and with what results were the following battles fought?—Sluys, the Fair of Lincoln, Solway Moss, Shrewsbury, Fontenoy, Worcester, Vittoria. Give dates.

6. Mention any occasions when an invasion of England was attempted or threatened by foreign powers.

7. What do you know of the Excise Scheme, the Quadruple Alliance, the Drapier Letters, the Alien Bill?

8. What did England gain by the Treaty of Utrecht? Mention the chief victories we gained, and any reverses we suffered, during the war which led to it.

9. What facts would you select, and how would you attempt to teach them, in giving a lesson on the battle of Poitiers or the battle of the Nile?

Arithmetic.

(Two hours. Answer *three* questions from Section 1 and *five* questions from Section 2.)

Section 1.

1. How would you set about giving a lesson on long division?

2. A child works the division 48773 ÷ 19, and say the quotient is 25517, what error was made? How would you teach children to avoid the error?

3. Employ short division in dividing 4103 by 105, taking the factors 3, 5, 7, and explain clearly your method of obtaining the remainder.

4. Define prime number, proportion, par of exchange, discount, with examples.

5. Find the L.C.M. of 259, 1443, and 273, and explain the reason of the process you employ.

Section 2.

6. A can reap in 8 days a field which takes B 9 days to reap. They work together at harvest, and earn £22, 10s. 6d. between

them. If they share it in proportion to the work they have respectively done, what should each receive?

7. Find the difference between the simple interest on £461, 5s. for two years at 4 per cent., and the discount on the same sum due after two years at 4 per cent.

8. A ship is worth £9,475. For what sum must it be insured at £5, 5s. per £100 in order that the owner, in case of loss, may receive both the value of the ship and the premium paid?

9. What is the least number which when divided by 33 leaves 32, when divided by 37 leaves 36, and when divided by 43 leaves 42 as a remainder? Explain the process of working.

10. Six horses and eight cows cost me £375. I sell them for £446, 5s., making a profit of 25 per cent. on the horses and 10 per cent. on the cows. What was the average cost of each horse and each cow?

11. If I sell out 2½ per cent. stock at 93¼, and buy 3 per cents. at 101¼, and by this transaction increase my income by £11, 10s. a year, how much had I in the 2½ per cents. at first (allowing the usual brokerage)?

12. Find the square root of 24·950025, and explain by reference to the principle of involution the reason of the process you employ.

PUPIL TEACHERS' COURSE.

For Candidates' Examination, 1904.

1. *Reading, Repetition, and Penmanship.*—Regular daily practice is needed.

2. *English.—The Elegy*, verses 25–28. Analyse and parse the whole. Learn meaning of all allusions, etc.

Line 99. *Brushing*, imperfect participle, qualifying *him*.

100. *To meet*, infinitive of purpose, limiting *brushing*.

103. *Would*, auxiliary of past imperfect tense, in this case governing *stretch*.

104. *Pore*, read *would pore*.

105. *Hard*, adverb, modifying the phrase *by yon wood*.

107. *Like*, adjective, qualifying *he* and governing *one* in objective case.

109. *Morn*, adverbial, objective case.

111. *Yet*, adverb, modifying the predicate.

3. *Arithmetic.*—Decimals: addition, subtraction, multiplication, and division.

Read up the theory of this carefully. Position of decimal point in multiplication and division must be clearly understood.

4. *Geography.*—Counties and towns of Scotland.

5. *History.*—Charles the First, Commonwealth.

The text-book deals with all the important points. Note exactly the direct causes of the outbreak of the war. Learn, with dates, a list of the battles fought, the leaders, the results.

In the Commonwealth the reduction of Scotland and Ireland and Cromwell's foreign policy are most important.

6. *Elementary Science.*—Pressure of liquids, Boyle's law, the barometer.

Quarterly Test Examination.

ENGLISH.

(One hour. Answer *three* questions.)

1. Analyse the following, and parse words in italics:—

> "*Far* from the *madding* crowd's ignoble strife,
> Their sober wishes never *learned to stray*;
> Along the cool sequestered vale of life
> They kept the noiseless tenor of their way."

2. "Even from the tomb the voice of Nature cries." What does this mean, and how is it illustrated in the poem?

3. Show by one other example in each case the meaning and use of the prefix or affix in the following words: busy, afield, repressed, moralist, homely.

4. Write a short explanation of—

"Pregnant with celestial fire."
"To heap the shrine of luxury and pride with incense."
"The boast of heraldry."

5. Write a short life of Gray, and mention any other of his poems you have read.

ARITHMETIC.

(One hour. Answer *three* questions.)

1. Find the value of $(3\frac{1}{2} + \frac{1}{8} + \frac{1}{16})$ of £12, 13s. 4d., working your sum by the method of practice.

2. What fraction is £2, 15s. $- \frac{3 \text{ lbs. } 12 \text{ oz.}}{2\frac{1}{2} \text{ cwt.}} \times$ 18s. 8d., of £9, 10s. $+ \frac{3 \text{ weeks } 4\frac{1}{2} \text{ days}}{23 \text{ hours}} \times$ 3s. 10d.

3. A grocer mixes 11 lbs. of tea at 2s. 6d. with 15 lbs. at 1s. 10d. and 14 lbs. at 4s. 2d. If he sells the whole at 3s. per lb., what does he gain per lb., and what is his total gain?

4. A town is provisioned for a siege of 6 weeks, its population being 20,000. How many people must leave the town in order that, at the same rate of consumption per head, the provisions may last for eight weeks?

5. A snail starts on 1st June to climb a wall at the rate of 2 feet per day, but during each night he slips down 18 inches while he sleeps. If the wall be 12 feet high, on the evening of what day will he first reach the top?

GEOGRAPHY.

(One hour. Answer *three* questions.)

1. Draw a sketch-map of the east coast of England, marking the chief physical features and the chief ports.

2. In what towns and districts are the following manufactured?—Lace, cotton, leather, paper, carpets, glass, and locomotives.

3. Where and what are Crewe, Fens, Eden, Coventry, Wilton, Bradford, Cader Idris, Lundy?

4. What do you know of the chief railways of England?

5. Give a list of the chief islands round Scotland, stating a few facts about each if you can.

HISTORY.

(One hour. Answer *three* questions.)

1. Tell the story of the quarrel between Henry the Second and Becket.

2. Write a short life of either (*a*) the Black Prince, or (*b*) Sir Walter Raleigh.

3. Write a few words about *one* of these—(*a*) The Black Death, (*b*) the Reformation, or (*c*) the Great Rebellion.

4. Explain in a few words who were De Montfort, Warwick the Kingmaker, Sir Thomas More, Drake.

5. Why did the Armada come? How was it defeated?

ELEMENTARY SCIENCE.

(Three-quarters of an hour. Answer *three* questions.)

1. A test-tube is weighted with shot so that it will float about three-quarters immersed in water. How will it behave if placed (1) in strong brine; (2) in alcohol; (3) in mercury?

2. A triangle is cut out of cardboard. Draw a figure to show how it will hang (1) when suspended by a thread fastened to one of its corners; (2) when suspended by a thread fastened to the middle point of one of the sides.

3. A truck which runs on a tram line is drawn by a horse. Explain why unless the horse pulls in a particular direction part of its strength is wasted. Illustrate your answer by a diagram.

4. What is meant by the "second order" of levers? Give illustrations of this order in ordinary life.

MUSIC.

(Fifteen minutes. Answer *three* questions.)

1. State which tones of the major scale have above them (*a*) major sevenths, and which (*b*) minor sevenths.

2. Rewrite the following in two-pulse measure, halving the value of each note and rest:—

| m : r .d | l_1 : t_1 | s_1 : d | r : | m : r .d | l : - .s | s : - .f | m : - ‖

3. Rewrite the above passage—(*a*) an octave lower, (*b*) an octave higher.

First Year.

1. *Reading and Repetition.*—Regular oral practice should be taken.

2. *Penmanship.*—Ten minutes' daily practice from the *Practical Teacher Copy Book*.

3. *English.*—Cowper's *Expostulation*, lines 221–257; or *The Task*, Book V., lines 220–259.

Paraphrase and analyse the whole, and parse any words presenting difficulty. Learn the derivation of all the important words. Twenty-five roots should be learnt each week.

4. *History.*—Edward the Sixth and Mary.

Note the progress of the Reformation; the government of Somerset and Northumberland; the great distress amongst the poor, culminating in Ket's rebellion; the descent of Lady Jane Grey; Wyatt's rebellion; the Marian persecution; and the war with France.

5. *Geography.*—Asia, China, and Japan, and the Malay Peninsula.

Use sketch-maps continually. Note the progress made by Japan of recent years.

6. *Arithmetic.*—Percentages. No explanation further than that given in the text-book (Christian and Collar) will be necessary. Any sums presenting difficulty should be sent up for solution.

7. *Science.*—Revise heat.

8. *Euclid.*—Props. 25, 26, with four deductions per week.

9. *Algebra.*—Simple fractions.

Quarterly Test Examination.

(Papers will be marked if desired. They should be sent to Mr. A. T. Flux, Oakleigh, Belvedere, Kent, with a fee of 2s.)

ENGLISH.

(One hour. Answer *three* questions.)

1. Analyse one of the following, and parse words in italics:—

(1.) "But war's a game which, *were* their subjects wise,
Kings *would* not play at. Nations would do well
To extort their truncheons from the puny hands
Of heroes, *whose* infirm and baby minds
Are gratified with mischief."

(2.) "*In vain* the nations, that had seen them *rise*
With fierce and envious *yet admiring* eyes,
Had sought *to crush* them, guarded as they were
By power divine, and skill that *could* not err."

2. Explain by derivation the meaning of—(*a*) *impending, fortuitous, commodious, abject, terraqueous*; or (*b*) *contagious, Providence, servility, tradition, exterminate.*

3. In what metre is the poem written? Quote a few lines, and scan them.

4. Give in your own words either Cowper's ideas on freedom, or the peculiar advantages bestowed upon England.

5. Point out the various ways in which the infinitive mood is used, and give examples of each.

HISTORY.

(One hour. Answer *three* questions.)

1. Write a short life of King Alfred.

2. What was the Black Death? Mention any important events which were wholly or in part caused by it.

3. Trace the campaign of Henry the Fifth in France. Illustrate your answer by a sketch-map.

4. Write a few lines about *four* of the following—Lanfranc, Wallace, John of Gaunt, Perkin Warbeck, Sir Thomas More, Caxton.

5. What do you know about the Constitutions of Clarendon, Poynings's Law, the Star Chamber, Statute of Provisors?

GEOGRAPHY.

(One hour. Answer *three* questions.)

1. Distinguish between a natural and a scientific frontier, and illustrate your answer by reference to the maps of Germany and France.

2. Describe a coasting voyage from Marseilles to Naples, and mention any facts of interest about the places you would pass.

3. "The German Empire is made up of a number of states which have certain rights of government within their limits." Explain as fully as you can.

4. Name and give the position of eight European islands or groups of islands.

5. Describe, with the aid of a sketch-map, the general build of Asia.

ARITHMETIC.

(One hour. Answer *three* questions.)

1. Find the G.C.M. and L.C.M. of 9384 and 13685. How may the working be materially shortened in the case of the G.C.M.?

2. What decimal of 13s. 4d. must be added to 1·3125 of £1 to make the total equal to ·5125 of £5?

3. A man buys eight cottages at £130 each, and he charges his tenants a rent of 2s. 6d. per week for each. What interest does he get on the money invested?

4. Find in the simplest way you can the difference between £24, 17s. 4d. × 7·02, and £24, 17s. 3d. × 7·03.

5. Divide a franc (= 100 centimes) among A, B, and C, so as to give A 20 centimes less than B and C together, and so as to give B 1·4 times as much as C. (Show the reasoning fully.)

ELEMENTARY SCIENCE.

(Three-quarters of an hour. Answer *three* questions.)

1. What temperature will a thermometer register if placed at the bottom of a frozen pond? How do you explain this?

2. How would you ascertain the melting-point of a small piece of wax from a wax candle?

3. What are the three things that happen to rays of light when they fall upon a body? What happens to sunlight when it falls on a red-glass window?

4. Why does clean water seem shallower than it really is? Illustrate your answer by a diagram.

5. The steam from a boiling kettle is passed into cold water. How is the temperature of the water affected? How do you account for the results you mention?

MUSIC.

(Fifteen minutes. Answer *three* questions.)

1. Rewrite the following passage in the imperfect method:—

d r m ˢd r m t, l d f m ʳl s m d.

2. Name the intervals—

d–fe, r–l, m–ta, r–dˡ.

3. Write out six measures of 6-pulse measure, varying the contents of the measures as much as possible.

Second Year.

1. *Reading, Repetition, and Penmanship.*—Regular daily practice in these subjects must be taken.

2. *Geography.*—Prepare Australia.

3. *History.*—Victoria. (For chief points, see Scholarship Course.)

4. *English.*—Milton's *Paradise Lost*, Book III., lines 556–644. Paraphrase the whole; be prepared to analyse any part and parse any word.

5. *Arithmetic.*—Measurements of solids. Chap. xlix. Christian and Collar.

6. *Elementary Science.*—Revise science. A collection of questions will be given next month.

Test Examination.

The questions should be answered under examination conditions. The answers will be marked if desired. They should be sent to Mr. A. T. Flux, Oakleigh, Belvedere, Kent, together with a fee of 2s.

GEOGRAPHY.

(One hour. Answer *three* questions.)

1. Name the principal races of Africa, stating which portions of the continent they respectively occupy. Give a few notes on their appearance and religion.

2. Give a description of the Great Karroo, with special reference to (*a*) climate and seasons, and (*b*) the conditions of life in the district.

3. Describe the chief industries of the United States.

4. Draw a map to illustrate the great lakes of Africa.

5. Mention the chief prairie states of North America, and name the chief outlets for the products of the district.

ENGLISH.

(One hour. Answer Question 1 *or* 2 and *two* others.)

1. Give in your own words Milton's idea of the universe.

2. Write in your own words the full substance of the following lines:—

"So will fall
He and his faithless progeny. Whose fault?
Whose *but* his own? Ingrate! he had of me
All he could have: I made him just and right,
Sufficient *to have stood*, though *free* to fall.
Such I created all the ethereal Powers
And spirits, both *them* who stood, and them who failed:
Freely they stood who stood, and fell who fell.
Not free, what proof could they have given sincere
Of true allegiance, constant faith, or love,
Where only what they needs must do appeared,
Not what they would? what praise could they receive?"

3. Analyse the lines from "Such I created" to "who fell," and parse words in italics.

4. Correct, if necessary, the following, giving your reasons:—

(1.) The captain with his crew were leaving the ship.
(2.) If this happens, which it may, let me know.
(3.) It's I who says so.
(4.) I like those sort of people.

5. How was Milton's writing affected by the thought of the people and the state of the times in which he lived? Give examples where possible.

OUR CERTIFICATE COURSE FOR 1904.

BY GEORGE COLLAR, B.A., B.SC.,
Head-master of the Stockwell Pupil Teachers' School.

TEST QUESTIONS ON LAST MONTH'S WORK.

THEORY OF TEACHING.

1. How would you deal with silent letters in teaching spelling?
2. Give a short summary of the *principles* of education laid down by Froebel.
3. In what ways did Froebel recommend us to call forth the *self-activity of the child?*

ENGLISH LANGUAGE AND LITERATURE.

1. Describe briefly *either* the visit of Sir Roger to Westminster Abbey, *or* his visit to the theatre.
2. Give an account of any three of the following persons—Will Wimble, Moll White, Sir Roger's chaplain, Sir Andrew Freeport.
3. Give a short account of the writings of Addison, and discuss his chief merits as a writer.

ENGLISH HISTORY.

1. Give an outline of the chief laws passed during the reign of Edward the First.
2. What was the "Statute of Labourers"? With what condition of affairs did it attempt to deal, and with what measure of success?

GEOGRAPHY.

1. What states make up the Balkan Peninsula? What is their political relation to other states?
2. Give a short account of the productions and trade of Norway and Sweden.
3. Where are the following, and for what are they noted?—Odessa, St. Nazaire, Vigo, Nuremburg, the Simplon, Archangel, the Engadine, and Kiel.

ARITHMETIC.

1. Reduce to its simplest form—

$$(0{\cdot}1 \times 0{\cdot}01 \div 0{\cdot}0002) - (0{\cdot}6375 \times \frac{1}{1{\cdot}7} \div 0{\cdot}125).$$

2. Find how many feet and how many metres there are in 0·158257 of a mile, having given that one metre equals 1·093638 yards.
3. Define a decimal fraction. Subtract 0·07063 from 1·003032. State the rule for multiplying one decimal by another. Find the product of 0·0256 and 1·0071, and divide the product by 2·7975.

ALGEBRA.

Solve the equations:—

(*a*)
$$\begin{cases} x - \frac{y}{10} + \frac{3}{10}z = 4\frac{1}{2}. \\ 7x + 2y + z = 51. \\ x + y - \frac{z}{2} = 8. \end{cases}$$

(*b*)
$$\begin{cases} x + w - 11 = 0. \\ y - z = 1. \\ x + y + z = 17. \\ 1 + 3z = w + 2y. \end{cases}$$

EUCLID.

1. Divide a given straight line AB in the points C and D so that if AC be equal to DB the square on AC shall be equal to the rectangle AB.CD.
2. Divide a given straight line into two parts so that the rectangle contained by them may be the greatest possible.
3. Divide a given straight line into two parts so that the sum of the squares on them may be the least possible.

[*N.B.*—The last two are very frequently set.

ELEMENTARY SCIENCE.

1. State the principle of the indestructibility of matter. In what sense can such a principle be said to be *proved?*
2. Mention cases of the disappearance of matter, and show that it has not been destroyed.

NOTES AND SYLLABUS FOR NOVEMBER.

ENGLISH COMPOSITION.

Study carefully the first two sections of Nesfield's *Senior Composition*, chapter x. By careful attention to the points set out there, and by a systematic examination of the essays given as models, the student will do much towards acquiring the power of writing a good essay. The essays given should be reproduced, first following the order of paragraphs and the proportions of the model, then in a condensed form, say a half or a third of the original length. In reducing or condensing an essay, the student has to exercise a great deal of judgment in the matter of proportion and of omission of detail. In subject-matter the same general proportions must be observed, each section bearing the same relation to the whole in the condensed essay as in the original; but in order that this may be effected, some details which are mentioned in the extended form must be omitted from the condensed account.

Prepare original essays on the following:—

1. Mountaineering as a recreation.
2. The progress of Egypt under British protection.
3. "The old order changeth, yielding place to new,
   And God fulfils Himself in many ways,
   Lest one good custom should corrupt the world."
4. "In writing 'tis the chief
   Of all perfections to be brief."

ENGLISH LANGUAGE AND LITERATURE.

Study the first book of the *Golden Treasury of Songs and Lyrics.*

The name "song" implies, in general, anything that may be sung, and "lyric" means strictly something that is intended to be sung to the accompaniment of the lyre or harp. Hence one of the chief characteristics of lyrical poetry is its rapidity. There may be a few comparisons and other figures of speech introduced, but lyrical poetry does not permit of meditation or of argument. The words must be the direct outcome and expression of the passions and emotions. Forgetful of this point, Wordsworth published, in his younger days, some poems which he called *Lyrical Ballads;* but as their chief character was reflection and not passion, he changed their title. Since, then, we may regard lyrics as being expressions of the passions, we shall naturally find that the poems in our collection will deal with those subjects which are capable of exciting the passions, such as love, revelry, war, loyalty, and patriotism. Sometimes the loss of a friend may prompt the poet to sing his praises; and the feeling of delight produced by some pleasant sight—"the greenwood tree," "a cot beside a hill," "the lesser celandine," etc.—may inspire a poet to give expression to his emotions in song. The student, in reading the poems in the *Golden Treasury*, should note the theme of each, and compare poems which treat of the same topic. Perhaps the finest love-songs are those in the second book, written by the "Cavalier Poets" Herrick, Suckling, Carew, and Lovelace. As examples see—

cxxiv. "Bid me to live, and I will live,
Thy Protestant to be."

cxxvii. "When Love, with unconfined wings,
Hovers within my gates."

cxii. "He that loves a rosy cheek,
Or a coral lip admires."

Among later writers of love lyrics, perhaps Burns holds the palm. See—

clxxxviii. "O Mary, at thy window be!
It is the wished, the trysted hour."

Lord Byron's love poems are very fine. See—

ccxiv. "There be none of Beauty's daughters
With a magic like thee;
And like music on the waters
Is thy sweet voice to me."

His "Maid of Athens" is another fine specimen. It is well known, but not included in the *Golden Treasury;*

There is a great range in the matter of refinement to be found in love poems, and frequently love is associated with drinking, as in—

clxviii. "Go fetch me a pint o' wine."

Songs which deal exclusively with drinking are naturally not numerous in the *Golden Treasury;* but war inspires many, as—

ccl. "Ye mariners of England
That guard our native seas!"

ccli. "Of Nelson and the north
Sing the glorious day's renown."

and cclxviii. Pibroch of Donuil Dhu.

Loyalty and patriotism form the theme of many in our collection, and it is really difficult to name the most beautiful.

We advise all of our readers to make a systematic study of each poem. Of course some merit more attention than others, but we recommend the following as the best way of studying a piece of poetry:—

1. Read the poem carefully through, and master its general

meaning. The subject-matter should be analysed, and the purpose of the poem noted, and also the way in which the several parts are related to one another. We will take Shakespeare's sonnet, "*Post Mortem*" (No. 67), as an example. The poet begs his friend to be lenient with his poetry should she read it after his death, and if she thinks it does not compare favourably with that of the time at which she reads it, to think that his poetic skill would have improved had he lived longer, and to read the works of other poets for their style, and his for his love.

2. Commit the whole, or parts, to memory. The student is advised to select specimens of each form—sonnet, ballad, and ode—as well as striking passages, and store them in his memory. We will not attempt to select passages for our readers, since their tastes differ. There is not a poem in the book that is not worth learning; but in making their selections students should exercise their critical faculty, and note down definitely what are the reasons for selecting a particular poem.

3. The next step is to deal with the structure of the poem. Beginning with the individual lines, we see that each line contains five feet, each of which consists of an accented syllable following an unaccented syllable. The second and fourth lines are exceptional in having an unaccented syllable at the end, thus forming weak or feminine rimes. All the others are strong or masculine—that is, the accented syllable comes at the end. The poem consists of fourteen lines, but it differs in certain points from what is now regarded as the correct form of a sonnet. All sonnets begin with two groups of four lines each, and in the *Golden Treasury* the divisions of the poem are made clear by spaces, but generally the whole poem runs straight on. The arrangement is one for the printer. Sometimes these eight lines have but two rimes, and may go alternately, but more commonly *a b b a a b b a*. (See 210, 233, 256, and 257.) Frequently a third rime is introduced into the first part, and the scheme is generally then *a b b a a c c a* (see 244, 254, 255); but the forms *a b a b a c a c* and *a b a b c b c b* are also used (see 317). It seems preferable to connect the two quatrains (or sets of fours) by having at least one rime common to both; but this is a rule seldom followed by Shakespeare. The second portion of a model sonnet consists of two terzettes. (See all the sonnets in Books III. and IV.) These may rime alternately, as in 245; or almost any other scheme may be adopted. The terzettes have generally one common rime, and this may also be common to the first section, but usually there is a new departure.

4. The next point is to study peculiarities in the individual words. *Well-contented*, here used in a subjective sense, not, as usual, in an objective one—that is, the day which will cause me contentment; *churl*, an ill-bred, surly person; *re-survey*, look upon again; *rude*, not polished; *exceeded*, which will have been exceeded; *height of happier men*, the pitch of excellence attained by men who have the good fortune to be born when the art of poetry has been brought to greater perfection; *vouchsafe*, to warrant without danger, to condescend to grant; *dearer birth*, a more precious production.

5. Next study the figurative expressions. Here we have *Death* personified as a churl who covers a person's bones with dust; *outstripped*, a metaphor drawn from racing; *Muse*, another personification, the poet's genius being regarded as a woman; *birth*, a metaphor founded on the resemblance between the production of a poem and the entrance of a child into this world. Moreover, the use of the abstract noun "birth" to denote that which is born is an example of autonomasia. There are other words which were originally metaphorical, but from which familiarity has taken all the figurativeness. Thus *style* meant originally the iron or steel point with which letters were scratched on a wax writing-tablet. If the writing was neatly done, those who saw it could tell at once that the writer "had a fine style;" so gradually the word "style" has come to denote not merely the quality of the writing itself, but the way of setting out the subject-matter.

It will be noted that the early sonnets ended not with two terzettes, but with a quatrain and a couplet.

Study in detail the fourth Act of *Henry the Fifth*. From a literary point of view this is perhaps the finest in the play, and the speeches on the battlefield are well worth committing to memory.

Theory of Teaching.

We gave last month a sketch of Froebel's principles, and trust that it may serve as an introduction to the translation of his *Erziehung der Menschheit*, which students are advised in their syllabus to read. The book is not definitely set as a text-book, and many may think that it will be possible to get through the examination without reading it. But there can be no doubt that even if no questions are asked on the contents of the book, the student who is familiar with the principles set out in it will obtain much higher marks for his pains; and besides, it is a book that all teachers, especially teachers in infant schools, should be familiar with if they want to carry on their work on right lines.

We will not attempt to enlarge upon the biography of Froebel, but will leave the student to master the facts. The introduction gives a good summary of Froebel's ideas, and we see that his view of the special destiny of man, as a being endowed with perception and reason, is that he should become fully and clearly conscious of his own essence—"the Divine element that is within him"—and manifest this forth in his life. Hence Froebel defines the education of man as the awakening and training of his humanity to consciousness and reflection, so that his outward life may be an expression of this inward law. This definition, and any other similar statements the student meets with, should be entered in the notebook and committed to memory. "The aim of education is to produce a pure, faithful, complete, and therefore holy life." If it is successful in its aims, "education will guide a man to the understanding of himself, to peace with Nature, and to union with God. Education, therefore, has to raise the human being to a knowledge of himself and of humanity, to a knowledge of God and of Nature, and to the pure and holy life which follows from this knowledge." Froebel then gives a most useful recommendation, although it is not stated in very clear terms, about not inferring from the outward to the inward, which we may extend into a Christian rule not to be in haste to attribute bad motives. The outward acts are not always the best things to judge another by. One pupil may commit very serious breaches of rules without intending to do so in his heart, while another may be most malevolently disposed, and yet sail so near the wind as to keep practically within the letter of the law. He then assumes that a young human being aims surely, if unconsciously, at what is best for itself. This assumption is true only within certain limits, and although it is illustrated by such comparisons as the natural tendency of ducklings to go to the water, and of chickens to scratch the ground for their food, there are, nevertheless, occasions when the desires of children may be compared rather with the propensity of moths for flying into the candle flame. The true position seems to be that the educator should observe the child's desires, and consider which are for its good. Spencer has shown us that many of the tastes of children—for example, their liking for sugar—are due to the fact that such things are physiologically good for them. The teacher must observe the child's nature, and aid it in the development of the child, not attempt to force the child to develop in a way that is contrary to nature. Although it may be thought that the pruning of a vine or fruit tree is a violation of the natural tendencies of growth, it is really nothing of the kind, but a treatment which is strictly in accordance with the natural law for the development of productive shoots and fruit-spurs.

Coercion is sometimes necessary, but it must be administered in such a way as to evoke love from within. "Wherever pressure destroys inward activity, and severity engenders rebellion and falsehood, *there* all genuine education—all true work of teaching and instruction—is at an end." The teacher should lead the child to see that he is giving commands not in his own interest, but in the cause of abstract right. Here we must add that the personal love a child bears to his parent or teacher is a strong force in securing the fulfilment of the parent's or teacher's wishes; and Froebel does not deny that the child's desire to please those whom it loves should be utilised in the formation of good habits. But the child must be led to see that the parent's commands are only an expression of the general law to which he is himself also obedient.

Each child and each generation must go through an epitome of the development of the human race; but it must be by growth and unfolding, in response to the natural stimulus from within. We can hardly agree with Froebel in regarding smiling as the dawning of the social feeling: it depends upon the cause. A child may lie in a room and smile and coo from the mere pleasurable sensation of warmth, etc., not from the pleasure of any one's society. The twenty-third paragraph is important as showing that Froebel considers that some things that children desire are not good for them, and therefore should not be supplied, and that children soon perceive the weakness of those who give them what they want merely to stop their crying. Locke's remarks on the spoiling of children by excessive humouring should be read in connection with this section. The remarks on the importance of example are weighty, though they are not original or specially peculiar to Froebel's system. The interdependence of the different stages of development is to be noted: "The vigorous and complete unfolding and improvement of each succeeding stage of life depends on the vigorous, complete, and original development of every preceding stage.....A boy is not a boy, or a youth a youth, simply because he has attained the age of boy or youth, but by virtue of having lived through, first, childhood, then boyhood, faithful to the claims of his soul, and mind, and

body. Just so man becomes a man not simply by reaching the average years of manhood, but by fulfilling the duties of all preceding stages of life—childhood, boyhood, and youth." Hence precocity is not to be encouraged. The introductory chapter concludes by insisting on the necessity of the practical side of education. We not only "learn by doing," but also prove our education to be real by our directed activity. "'God created man in His own image, in the image of God created He him;' therefore man ought to create and work like God."

Prepare the first part of chapter ix. in Collar and Crook's *School Management*. Grammar, as a rule, is not satisfactorily taught in our schools, and very little advantage comes of the teaching. It should, however, be one of the most beneficial.

English History.

Go carefully through the history from 1399 to 1485. Notice the delicacy of the position of Henry Bolingbroke on the deposition of Richard the Second. Had he been content to act as regent for young Edmund Mortimer, the Wars of the Roses would have been avoided. But it is perhaps expecting too much to suppose that under such circumstances Henry would not endeavour to obtain the crown for himself. He could not claim it as the heir, although there was a popular legend that Edmund of Lancaster, from whom he was descended on his mother's side, was really the eldest son of Henry the Third, and was passed over on account of his deformity; and although this would not bear investigation, Henry used it for all it was worth. Again, he could not claim merely that the public good required that he should come to the throne, for that would have given the nobles an excuse for deposing him later on should they get tired of him. His real claim was the right of conquest; but he knew that he would at once offend his supporters if he advanced that. His statement of claim, therefore, was purposely vague, but very skilfully put: "Inasmuch as I am descended by right line of blood from the good lord King Henry the Third, and through that right which God of His grace has sent me with help of my kin and of my friends to recover it; the which realm was in point to be ruined through default of governance, and through the overthrowing of good laws."

Note the relations with Scotland. Henry burned Edinburgh, 1401. Douglas, attempting to retaliate, was defeated at Homildon Hill. Peace secured by the capture of Prince James, and his detention in England.

Henry rewarded his ecclesiastical supporters by instituting religious persecutions.

The war with France merits particular attention, as it forms the subject of the Shakespearian play to be studied.

The Wars of the Roses take a very prominent place in history—perhaps too prominent, considering that their only purpose was to decide which of two rival houses should have the crown. The account of their progress presents no difficulty. Their effect in reducing the power of the nobles should be considered, and their termination on Bosworth Field marks the close of the Middle Ages. Study the social development of the country during the period.

Geography.

Study the physical geography of Asia. Practise outline maps, and take notice of the general elevation of the continent as shown on a relief map. In dealing with the mountains, it is best to start with the table-land of Thibet as a centre from which to work out the system. Notice the Himalaya Mountains to the south, and the Kuen-lun Mountains going towards the north, and then take in detail the ranges connected with each. The elevated plateaus form very characteristic features—the Pamirs, Mongolia, and the desert of Gobi or Shamo. Farther off are the plateaus of Afghanistan, Persia, Arabia, Asia Minor, the Deccan, and Mongolia. Observe how the land gradually becomes lower towards the north, forming the great plain of Siberia, and the cold, swampy lowlands—called *Tundras*—near the Arctic Ocean. The rivers are easily mastered, as they fall into two natural groups—those flowing north, and those flowing south. The areas of inland drainage are remarkable. The Caspian Sea has an area of 120,000 square miles, and receives the water of a large number of rivers, including the Volga (the longest in Europe), the Ural, the Emba, and the Atrek. The Sea of Aral (over 25,000 square miles) receives the Amoo (or Jihoon, a river known to the ancients under the name of Oxus) and the Sir, or Sihoon. Lake Balkash is another inland sea, while Lake Baikal is drained by the Angara into the Yenesei. The Dead Sea is quite small, but it is noted for the extreme saltness of its waters, and for its connection with sacred history. Its surface is over 1,200 feet below the level of the Mediterranean. The climate requires attention, and the nature of the winds particularly. The monsoons require careful study, as do also the productions.

Arithmetic.

The study of the metric system follows naturally on the study of decimals. The advantages of the system must be remembered.

1. It is a decimal system—that is, each unit is ten times as great as the one next below it, and hence, when children have been taught to write similar units under one another, they can work compound sums with the same facility as simple ones.

2. A very simple relation connects all the units of length, area, volume, capacity, weight, and money. (See chapter xxiv.)

3. It offers a means of universal commerce.

Of course the imperial system would do this, *if other countries could be induced to adopt such an inconvenient system.*

When the system is first adopted in this country—and we hope that this will not be long—it will be of the highest importance to be able to convert from imperial units to metric units rapidly. For this purpose, and also to ensure that the terms employed are not merely empty names, the approximate values given on page 192 should be committed to memory. Nothing particularly fresh will be found in the chapters on practice and bills, except the importance of using the smallest possible number of parts, and applying complementary addition to the abbreviation of the work. The examples at the end of chapter xxviii. will afford valuable training in the way of dealing with problems. The student should try to work these without the help of the "Key," which should be referred to afterwards to see whether the best and shortest methods have been followed. Any difficulties that still remain may be sent up.

Algebra.

Revise the chapters on factors, for a ready knowledge of factors lies at the root of all good work in algebra.

Study the chapter on quadratics, and work examples. If x^2 has a coefficient, and you are working by the method of completing the square, do not *divide* throughout by that coefficient, as the text-books recommend—a plan which needlessly involves fractions—but *multiply* either by the whole coefficient or by a factor which will make it into a complete square. Example:—

$$5x^2 - 8x - 21 = 0.$$

Multiply by 5: $25x^2 - 40x - 105 = 0.$

The left-hand member of the equation is made into the square of $5x - 4$ by adding 121 to each.

$$25x^2 - 40x + 16 = 121. \quad \therefore 5x - 4 = \pm 11.$$

$$5x = 4 \pm 11 = 15 \text{ or } -7. \quad \therefore x = 3 \text{ or } -\tfrac{7}{5}.$$

Euclid.

Prepare to the end of Book III., Prop. 31.

Elementary Science.

Study the composition of water and of air. Up to about a hundred and twenty years ago water was regarded as an element; but in 1781 Cavendish found that when hydrogen was exploded with air water was produced. Carrying on his researches still further, he proved that the maximum quantity of water was produced when two volumes of hydrogen were used with one of oxygen, and moreover, he showed that when the combination occurred there was no loss of weight. As he believed the erroneous theory of combustion which was accepted in his day, he was unable to see the true teaching of his own experiments; and the true explanation of the composition of water was first given in 1783 by Lavoisier, the great French chemist, who repeated the experiments of Cavendish. The composition may be shown in a variety of ways, but the student must not confuse them. The methods are either analytical or synthetical, and may show the composition by volume or by weight.

Analytical:—

1. Water may be split up by an electric current (electrolysis), and the volumes of the gases produced may be measured.

2. Steam may be decomposed by passing over hot iron, and the volume of hydrogen given off, and the weight of oxygen combined with the iron determined—the latter with difficulty.

Synthetical:—

1. Oxygen and hydrogen may be exploded together, the proportions observed, and by keeping the tube hot the volume of steam produced may also be measured.

2. Hydrogen may be passed over heated copper oxide, and the weight of oxygen lost by the copper, subtracted from the weight of water produced, will give the weight of the hydrogen which has entered into the composition of the water. The student should remember the reason for using *copper oxide* instead of mercuric oxide or one of the other oxides which will give up oxygen when heated. If no hydrogen were passed over the oxide during the experiment, it would be found that no oxygen would be given off. Hence we know that all the oxygen given off during the experiment has combined with the hydrogen, which would not have been the case had other oxides been used.

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1. Each correspondent is restricted to *one* question.
2. Each query must be accompanied by the name and address of the correspondent, and the *coupon* which appears on the back wrapper of the current number of the Journal.
3. CORRESPONDENTS MUST IN ALL CASES STATE THE SOURCE FROM WHICH THEIR QUERY HAS BEEN OBTAINED.

The Editor reserves to himself the right to decline to answer any question which is, in his judgment, unsuited to the Magazine.

Boot.—If $\tan\phi = \dfrac{\sin\alpha\sin\theta}{\cos\theta - \cos\alpha}$,

prove that $\tan\theta = \dfrac{\sin\alpha\sin\phi}{\cos\phi \pm \cos\alpha}$.

From the given equation we have—

$$\tan\phi\cos\theta - \tan\phi\cos\alpha = \sin\alpha\sin\theta.$$

Then, if x denote $\tan\theta$, we have—

$$\frac{\tan\phi}{\sqrt{(1+x^2)}} - \tan\phi\cos\alpha = \frac{x}{\sqrt{(1+x^2)}}\sin\alpha.$$

$$\therefore \tan\phi - \tan\phi\cos\alpha\sqrt{1+x^2} = \sin\alpha\,.\,x.$$

$$\therefore (\tan^2\phi\cos^2\alpha - \sin^2\alpha)x^2 + 2\sin\alpha\tan\phi\,x - \tan^2\phi\sin^2\alpha = 0.$$

$$\therefore x = \frac{-\sin\alpha\tan\phi \pm \sqrt{\{\sin^2\alpha\tan^2\phi + \sin^2\alpha\tan^2\phi (\tan^2\phi\cos^2\alpha - \sin^2\alpha)\}}}{\tan^2\phi\cos^2\alpha - \sin^2\alpha}$$

$$= \frac{\sin\alpha\tan\phi[-1 \pm \sqrt{\{1+\tan^2\phi\cos^2\alpha - \sin^2\alpha\}}]}{\tan^2\phi\cos^2\alpha - \sin^2\alpha}$$

$$= \frac{\sin\alpha\tan\phi[-1 \pm \sqrt{\{\cos^2\alpha + \tan^2\phi\cos^2\alpha\}}]}{\tan^2\phi\cos^2\alpha - \sin^2\alpha}$$

$$= \frac{\sin\alpha\tan\phi[-1 \pm \sqrt{\{(1+\tan^2\phi)\cos^2\alpha\}}]}{\tan^2\phi\cos^2\alpha - \sin^2\alpha}$$

$$= \frac{\sin\alpha\tan\phi\left[-1 \pm \dfrac{\cos\alpha}{\cos\phi}\right]}{\tan^2\phi\cos^2\alpha - \sin^2\alpha}$$

$$= \frac{-\sin\alpha\tan\phi\left[1 \mp \dfrac{\cos\alpha}{\cos\phi}\right]}{\dfrac{\sin^2\phi\cos^2\alpha - \sin^2\alpha\cos^2\phi}{\cos^2\phi}}$$

$$= \frac{-\sin\alpha\sin\phi(\cos\phi \mp \cos\alpha)}{\sin^2\phi\cos^2\alpha - \cos^2\phi\sin^2\alpha}$$

$$= \frac{-\sin\alpha\sin\phi(\cos\phi \mp \cos\alpha)}{\sin(\phi+\alpha)\sin(\phi-\alpha)}$$

$$= \frac{-\sin\alpha\sin\phi(\cos\phi \mp \cos\alpha)}{2\sin\dfrac{\phi+\alpha}{2}\sin\dfrac{\phi-\alpha}{2}\,.\,2\cos\dfrac{\phi+\alpha}{2}\cos\dfrac{\phi-\alpha}{2}}$$

$$= \frac{-\sin\alpha\cos\phi(\cos\phi \mp \cos\alpha)}{-(\cos\phi - \cos\alpha)(\cos\phi + \cos\alpha)}$$

$$= \frac{\sin\alpha\cos\phi(\cos\phi \mp \cos\alpha)}{(\cos\phi - \cos\alpha)(\cos\phi + \cos\alpha)}$$

$$= \frac{\sin\alpha\cos\phi}{\cos\phi \pm \cos\alpha}.$$

$$\therefore \tan\theta = \frac{\sin\alpha\cos\phi}{\cos\phi \pm \cos\alpha}. \quad Q.E.D.$$

T.R., St. Anstell.—You will find it necessary to read up the elements of *determinants*. The chapter on this subject in C. Smith's *Treatise on Algebra* will suffice for your present requirements.

Replies to *Millicent, S.R., L.L.A., M.W., Gorgon, Vivian, Boot, Dunelmn, and T.R., St. Anstell,* will appear next month.

Vict.—How many numbers less than 10,000 can be made with the eight digits 1, 2, 3, 0, 4, 5, 6, 7?

(Hall and Knight's *Higher Algebra.*)

In accordance with the given conditions we may have numbers consisting of one digit, or of two digits, or of three, or of four, but no others.

1. Of numbers consisting of one digit only we have obviously seven, 0 not being counted as a number.

2. Numbers consisting of two digits.

(1.) When the digits are alike we have seven numbers.

(2.) When the digits are unlike the numbers are equal to the permutations of eight things taken two together, *less* those arrangements in which zero occupies the extreme left-hand place. Hence we have here $8 \times 7 - 7 = 49$ numbers.

3. Numbers consisting of three digits.

(1.) When the digits are all alike we have seven numbers.

(2.) In the case in which all three digits are different we have the number of arrangements which can be made of eight digits taken three together, *less* those arrangements in which zero occupies the extreme left-hand place. The total number of arrangements of eight different digits taken three together is $8 \times 7 \times 6 = 336$. But the number of arrangements of the seven digits 1, 2, 3, 4, 5, 6, and 7 taken two together is $7 \times 6 = 42$; and we may place the zero on the extreme left-hand side of each of these forty-two arrangements. Hence the number of arrangements in this case is $336 - 42 = 294$.

(3.) When two of the three digits are alike, and the remaining one different, the number of combinations of three digits is obviously $8 \times 7 = 56$. Each of these fifty-six combinations of three digits, in which two digits are alike and the remaining one unlike, admits of $\dfrac{3.2.1}{2.1.1} = 3$ arrangements. Hence the total number of arrangements under this head is $56 \times 3 = 168$. But it is easily seen, from considerations similar to those given under 3 (2) above, that in twenty-one of these 168 arrangements zero occupies the extreme left-hand place. Hence under this head we have $168 - 21 = 147$ numbers.

4. Numbers consisting of four digits.

(1.) When all the four digits are alike we have seven numbers.

(2.) When all the four digits are different, then, from considerations similar to those detailed under 3 (2) above, we have $8 \times 7 \times 6 \times 5 - 7 \times 6 \times 5 = 1470$ numbers.

(3.) When the four digits consist of two pairs, and the digits in each pair are alike. Here we can have the combinations of eight pairs of digits taken two pairs together.

This gives $\dfrac{8 \times 7}{2 \times 1} = 28$ combinations of four letters. Since in each of these combinations the letters are alike in pairs, each combination admits of $\dfrac{4 \times 3 \times 2 \times 1}{(2 \times 1)(2 \times 1)} = 6$ arrangements. The total number of arrangements under this head is therefore $28 \times 6 = 168$. But it is easily seen that in twenty-one of these zero occupies the extreme left-hand place. Hence under this head we have $168 - 21 = 147$ numbers.

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EXPERIMENTAL PHYSIOGRAPHY

(Section I.).

By POLLARD WILKINSON, B.A., B.Sc., F.R.A.S.

Organizing Master and Supervisor of Pupil Teachers' Instruction, Ipswich Board School; Head-Master of Ipswich Higher Elementary School; Lecturer on Physiography, Ipswich Science and Technical School; formerly Lecturer on Physiography at the City of London Day Training College and the Woolwich Polytechnic.

CONTENTS.

Matter and its Measurement; Motion, Inertia, and Force; Mechanical Powers and the Centre of Gravity; Rotation and Energy; Heat and Temperature; Radiation; Chemical Composition of Matter; Magnetism; Liquid Pressure; Gas Pressure.

APPENDIX:—Syllabus of Physiography—Section I. of the Board of Education; Syllabus of Elementary Science Section I. for the King's Scholarship Examination. Examination Papers—Physiography, Section I., May 1902; King's Scholarship, December 1902; Certificate, 1903. Questions and Model Answers, Physiography—Section I., May 1903; Section I., June 1903. Answers to Examples.

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(4.) When two of the digits are alike and the remaining two different. Any one of the eight pairs of like digits can be combined with any two of the remaining seven digits. This gives us $8 \times \frac{7 \cdot 6}{2 \cdot 1} = 168$ combinations. Each of these 168 combinations admits of $\frac{4 \times 3 \times 2 \times 1}{(2 \times 1)(1)} = 12$ arrangements. The total number of arrangements possible under this head is therefore $168 \times 12 = 2016$. Now, taking any pair of like digits, *except two zeros*, we may combine these with each of the remaining six digits, omitting the zero. In this way we obtain 7×6 combinations, each consisting of three digits, two of which are alike. These admit of $7 \times 6 \times \frac{3 \times 2 \times 1}{2 \times 1} = 126$ arrangements; and by placing zero before each of these, we see there are 126 numbers under this head, each containing zero once only, and in which the zero occupies the extreme left-hand place.

Further, taking a pair of zeros we can combine these with $\frac{7 \times 6}{2} = \frac{42}{2}$ pairs of different digits. Each of these twenty-one combinations will admit of $\frac{4 \times 3 \times 2 \times 1}{2 \times 1} = 12$ arrangements; and it is obvious that in six of these twelve arrangements a zero will occupy the extreme left-hand place. We have therefore the further number of $21 \times 6 = 126$ arrangements in which a zero occupies the extreme left-hand place. Hence we see that under this head there are $126 + 126 = 252$ arrangements in which a zero occupies the extreme left-hand place. It follows then that under this head we can have $2016 - 252 = 1764$ numbers.

(5.) When three of the digits are alike and the remaining one different. Here we have obviously $8 \times 7 = 56$ combinations, each containing four digits, three of which are alike. Each combination admits of $\frac{4 \times 3 \times 2 \times 1}{3 \times 2 \times 1} = 4$ arrangements. We have, therefore, a total of $56 \times 4 = 224$ arrangements possible under this head. But it is readily seen that in twenty-eight of these a zero will occupy the extreme left-hand place. Hence under this head we have $224 - 28 = 196$ numbers.

We have therefore a total of $7 + 7 + 49 + 7 + 294 + 147 + 7 + 1470 + 147 + 1764 + 196 = 4095$ numbers.

Caloric.—(*a*) A light metal ring is suspended over the end of a solenoid. If a current is suddenly sent through the solenoid, show that the ring will be repelled.

(*b*) Under what conditions is a suspended coil galvanometer "dead beat"? (S. and A., 1903.)

(*a*) When the current is suddenly sent through the solenoid, an induced current will be started in the metal ring, which forms a closed circuit. The current in the ring will be in the opposite direction to that in the solenoid. The system will therefore consist for the moment of two parallel circuits, with the currents flowing in opposite directions.

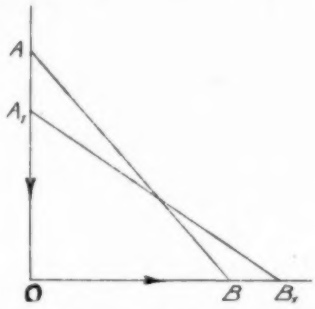
It will be obvious that this corresponds to a system of two magnets having their like poles together. The ring will therefore be repelled under all circumstances. It will be noticed that the reasoning is independent of the direction of the current or the nature of the pole.

(*b*) A suspended coil galvanometer is said to be "dead beat" when it takes up its final position quickly after closing a circuit. In the simplest galvanometer the needle moves past its position of rest, and then oscillates for some time before finally stopping. The stopping is facilitated by introducing a closed circuit round the suspended coil. Usually the coil of insulated wire is wound on a copper ring. Suppose the current to be started, the ring will move; and as it is placed in a strong magnetic field, induced currents will be set up in the copper ring.

As the production of heat is proportional to the product of the square of the current and the resistance of the ring, energy will be continually disappearing from the oscillating coil to heat the ring. This acting as a brake makes the instrument "dead beat."

Thus, for example, if the coil of a suspended coil galvanometer is contained in a silver tube, eddy currents are set up in the tube when the coil moves. The direction of these currents is always such as to tend to stop the motion of the coil, and is sufficient to prevent the suspended coil setting up an oscillatory motion. Other metals besides silver may be used for damping the motion of the coil. Silver is, however, the best. It is not only the best conductor, but, in addition, offers little resistance to the eddy currents.

Cymro.—Two particles, A and B, are moving along lines which meet at right angles at O. One is receding from and the other approaching O. If at any time their velocities are inversely in the ratios of their distances from O, show that the distance between them is constant.



Let A and B represent one position of the particles, and A_1, B_1 another position.

Let v denote the velocity of A in the direction towards O, and u the velocity of B in a direction from O.

Then the condition to be satisfied is that $\frac{v}{u} = \frac{OB}{OA}$.

From the right-angled triangle OAB we have—

$$AB^2 = OA^2 + OB^2.$$

Similarly, from the right-angled triangle OA_1B_1,

$$A_1B_1^2 = OA_1^2 + OB_1^2.$$

But $OA_1 = OA - AA_1$, and $OB_1 = OB + BB_1$.

Hence by substitution we obtain—

$$A_1B_1^2 = OA^2 + AA_1^2 - 2OA \times AA_1 + OB^2 + BB_1^2 + 2OB \times BB_1. \quad (1)$$

The average velocity of A will be $\frac{2}{OA + OA_1}$—that is, velocity at the middle of AA_1.

Similarly, the average velocity of B will be $\frac{2}{OB + OB_1}$.

Hence, as the time of travelling over AA_1 and BB_1 is the same, we obtain—

$$AA_1 \times (OA + OA_1) = BB_1 \times (OB + OB_1).$$

That is, $AA_1 \times OA + AA_1 \times OA_1 = BB_1 \times OB + BB_1 \times OB_1$.

$$\therefore 2AA_1 \times OA - AA_1^2 = 2BB_1 \times OB + BB_1^2.$$

That is, $2BB_1 \times OB + BB_1^2 - 2AA_1 \times OA + AA_1^2 = 0$.

Substituting this value in (1), we find—

$$A_1B_1^2 = OA^2 + OB^2 = AB^2.$$

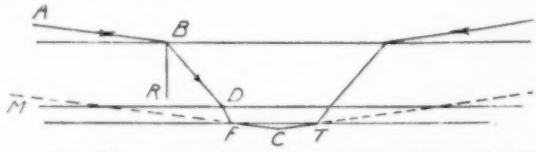
$$\therefore A_1B_1 = AB.$$

Hence the distance between the particles is constant under the given conditione.

From the recent solution given in these columns, you will see that when the simple notation of the calculus is used the solution is at once simple and compact.

F. W. Tomlinson.—At a depth of some metres in a smooth sea the appearance is said to be that of surrounding dark walls, and a clear circular illuminated region above. Explain this appearance, and discuss the effects on it of (*a*) ripple, (*b*) heavy sea.

How would the appearance be modified if the view were taken from inside a submarine boat looking up through a flat horizontal plate of glass? (B.Sc., 1902.)



Let AB represent the surface of the water, and C the position of the observer. Rays of light from all directions above the surface of the water will reach the observer, but owing to *refraction* these will appear to be confined to the cone KCL. The angles RDC and SEC represent the critical angles. Outside this cone nothing will be seen except what is seen by *reflection* at the surface of the water, as at FTC. In the sea, with no objects near the surface, all the region outside the cone would appear dark.

(*a*) If ripples passed over the surface, then light would

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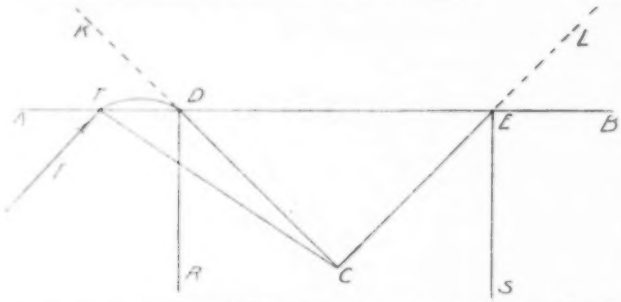
reach C so long as the angle between the line joining any point on one of the ripples and the normal at the same point was less than the critical angle. When, however, the angle joining any point on a ripple was greater than the critical angle, no light would reach C, although the point itself might be within the original cone of illumination.

It will be evident in this case that instead of the appearance being that of an illuminated circle surrounded by dark walls, the appearance would be that of a number of bands of alternate darkness and brightness travelling across the surface. The shapes of the bands would obviously depend on the forms of the ripples. In the case of large waves these would be broken up irregularly, and the appearance presented would be that of irregular and constantly changing patches of darkness and brightness.

If the view is taken through a plate of glass with sides parallel to the smooth water, the appearance will be much the same as it would be if the water were not present.



Thus consider a ray ABDF entering the water at grazing incidence. This will be refracted at the critical angle RBD. On reaching the glass at D it will again be refracted towards the normal, pass through the glass, and pass into the air in the boat in a direction FC parallel to its original direction AB—that is, practically parallel with the surface of the water. Such a ray received by the eye at C appears to come in the direction MFC. In a similar manner a ray to the right of C would pass through the glass, and pass into the air in the boat in a direction parallel to its original direction—that is, practically parallel to the surface of the water. Thus the whole angle (which is practically two right angles) is illuminated. The illumination directly overhead will necessarily be brightest, because in that region there is less loss by reflection. In a horizontal direction, due to the great loss by reflection, the illumination will be comparatively feeble.

Dum Spiro, Spero.—The focal length of a lens *in vacuo* is two feet. The refractive indices of glass and water being respectively $\frac{3}{2}$ and $\frac{4}{3}$, find the focal length of the lens when placed in water. (*Text-Book of Light*, by R. W. Stewart, p. 122.)

Let r_1 and r_2 be the radii of curvature of the surfaces of the lens, while μ is the index of refraction from the medium surrounding the lens to the glass. Then the focal length f of the lens is given by

$$\frac{1}{f} = (\mu - 1)\left(\frac{1}{r_1} - \frac{1}{r_2}\right) \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

When the lens is placed *in vacuo*, its focal length f_1 is found by substituting μ_1, the index of refraction from a vacuum to glass, for μ in the above formula. μ_1 will here be the refractive index of glass, and thus equals $\frac{3}{2}$.

$$\frac{1}{f_1} = (\mu_1 - 1)\left(\frac{1}{r_1} - \frac{1}{r_2}\right) \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

When the lens is placed in water, the index of refraction μ_2 from the water to the glass is equal to the refractive index of the glass, divided by that of the water. Thus $\mu_2 = \frac{3}{2} \div \frac{4}{3} = \frac{9}{8}$. The focal length f_2 of the lens in water is found by substituting μ_2 for μ in (1). Then

$$\frac{1}{f_2} = (\mu_2 - 1)\left(\frac{1}{r_1} - \frac{1}{r_2}\right) \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (3)$$

Dividing (2) by (3), we obtain—

$$\frac{f_2}{f_1} = \frac{\mu_1 - 1}{\mu_2 - 1} = \frac{\frac{3}{2} - 1}{\frac{9}{8} - 1} = \frac{\frac{1}{2}}{\frac{1}{8}} = \frac{8}{2} = 4.$$

$$\therefore f_2 = 4 \times f_1 = 4 \times 2 = 8 \text{ feet.}$$

The answer you quote as given in Stewart's book (that is, 2·25 feet) is thus incorrect.

Zeno.—Without assuming any incorrectness, discuss the grammar of these idioms, with special reference to the words italicised:—

1. His constancy *as a defender* of the truth was unalterable.
2. No *less a person* than the Archbishop was present.
3. They saw *each other* frequently.
4. We gazed upon that *gem of a building* the Taj Mahal.
5. He had no boy of his own age to play *with*.

1. Too much attention is often paid to words that show relation. It must be remembered that these words do not make the relation, but merely indicate it: the relation already exists in the thought. Here *defender* stands for the person who has the constancy—that is, it is in apposition with *his*. This would have been more clear if the sentence had been, "The constancy of him, a defender....."

2. Here *less* is an adjective in the comparative degree, qualifying person. The phrase *than the Archbishop* forms the complement of less. Moreover, *person* here is used in a quasi-abstract sense, so that less does not refer to size, but to dignity.

3. *Each other* is a reciprocal pronoun, used to avoid the repetition of the sentence in the inverted form: for example, instead of saying, "A saw B, and B saw A," we say, "A and B saw each other," "A and B" forming the subject, and "each other" the object, of the sentence.

4. Here *gem of a building* means, literally, "gem (which consists, or is made) of a building"—that building which constitutes a gem. Gem, of course, is a metaphor. Compare "that fool of a man."

5. We might regard *with* as a preposition governing a word understood—*to play with him*, or *with whom to play*—but really it goes with play to denote one idea. Compare German *mitspielen* or Latin *colludo*.

C. W.—Watson's *Text-Book of Physics*, together with Deschanel's volumes on *Sound*, *Light*, *Heat*, *Magnetism and Electricity*, might prove sufficient for the "Experimental Physics" in the Final B.Sc. Examination, London University. There is, however, some risk in trusting to the above books, as they do not entirely cover the ground required by the Examining Board. We should recommend the following books to a student anxious to be thoroughly prepared:—*General Properties of Matter*, by Professors Poynting and Thomson (Griffin); *Sound*, by Professors Poynting and Thomson (Griffin); *Heat for Advanced Students*, by Edwin Edser (Macmillan); *Light for Students*, by Edwin Edser (Macmillan); *Electricity and Magnetism*, by G. Carey Foster and A. W. Porter (Longmans); Geikie's *Class Book of Geology* (Macmillan) and Bauerman's *Mineralogy* (Longmans).

Esk.—Explain the theoretical justification of the empirical law that the resistance of a material devoid of rigidity to the passage of a sphere is proportional to the density of the medium and the square of the velocity and diameter conjointly, and define the terminal velocity.

Determine the terminal velocity of raindrops falling vertically when they make straight streaks at a slope of 1 inch vertical for 3 inches horizontal on the glass of a railway carriage going at 45 miles an hour, and determine the terminal velocity of hailstones, each composed of the congelation of a million such raindrops. (B.Sc., 1901.)

The first part is bookwork. There is not space in these columns for its insertion.

The terminal velocity of a body is reached when the energy of the resistance to motion is equal to the energy supplied to the body during the same time.

Terminal velocity of raindrops is furnished by the horizontal component of the streaks on the glass—that is, terminal velocity = $\frac{1}{3} \times 45 = 15$ miles per hour.

$\therefore$ terminal velocity = $15 \times 5280 \div 3600 = 22$ ft. per sec.

Resistance to sphere = $c\rho v^2 d^2$, where ρ denotes density, v the velocity, d the diameter, and c is a constant.

The urging force is the weight W of a raindrop.

$\therefore$ terminal velocity of raindrop = $W = c\rho v_1^2 d_1^2$, where v_1 denotes its velocity and d_1 its diameter.

When a million such raindrops have congealed, then, neglecting difference of density between water and ice, we obtain

$$1000000W = c\rho v_2^2 (100 d_1)^2,$$

where v_2 denotes the terminal velocity of the hailstone.

Hence $\frac{100W}{W} = \frac{c\rho v_2^2 d_1^2}{c\rho v_1^2 d_1^2}$. $\therefore \left(\frac{v_2}{v_1}\right)^2 = 100$. $\therefore v_2 = 10 v_1$.

Now $v_1 = 15$ miles per hour, or 22 ft. per sec.

Hence $v_2 = 150$ miles per hour, or 220 ft. per sec.

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THE AUSTRALIAN FLORA.

BY G. H. ADCOCK, F.L.S.,
Lecturer in Botany, Agricultural Department, Victoria; Examiner in Botany, Education Department, Victoria.

ONE of the most striking features of the Australian flora is the vast and dense forests of eucalypts which are found nearly all over the continent. It is remarkable, too, that these trees are purely Australian, and are strictly confined to the mainland and a few of the adjacent islands. Even in New Zealand they are not indigenous, nor, as a matter of fact, are any of our Australian plants that attain the rank of trees.

The eucalypts form a very important section of the natural order of which the classical myrtle is the type, and which also includes our so-called tea-trees and many other plants. The name eucalyptus is a well-chosen one, and directs attention to the seed-vessel being "well covered." The intra-marginal vein characteristic of this order is prominent in the foliage.

Some of these trees attain dimensions that rival the gigantic Wellingtonias of California. While some are stately trees, yet it must be admitted that there are a number of kinds that are remarkable for their dwarf, stunted, and often gnarled appearance, such as that presented by some species popularly known as mallee.

Most eucalypts have flowers of the pale-yellowish and slightly greenish tinge so prevalent in our flora; but others are of richer colours—scarlet, crimson, pink, or yellow. Perhaps the "fig-leaved" eucalyptus, with its trusses of scarlet flowers, is the gem of the species.

The leaves of eucalypts (which, by the way, are inappropriately called gum-trees) hang vertically. This interferes with the amount of shade they give. It seems to be a provision, as also are their leathery texture and multitude of oil-glands, to enable them to withstand the great heat. Hanging as they do, the full surface of the blade is not exposed to the direct rays of a meridian sun.

The number of stomata (sometimes called "breathing-pores") found on the leaves is very large. In some cases it reaches 150,000 or more to the square inch. In some species the numbers are, and in others they are not, the same on both surfaces of the leaf blade.

In a utilitarian sense these trees occupy a high place. The oil obtained from their foliage is antiseptic, and is extensively used in medicine and surgery. The timber of many species is exceedingly durable—red gum, jarrah, etc., being well-known instances. Many of our native timbers have a specific gravity greater than that of water. This appears almost incredible to those whose experience has been confined to European timbers merely.

The planting of the "blue-gum" in malarial districts in Italy and elsewhere has been attended with excellent results, and by rendering these parts healthy has earned for this species the name of "fever-tree."

While the eucalypts cover areas much greater in extent than any other kind of tree in Australia, yet they come second in point of number of species to the acacias, whose name records the fact that the earlier-known plants were spiny. These interesting plants are represented by over 300 species in Australia. For utility, attractive appearance, and wide distribution this genus is equally remarkable. The colour and perfume of their flowers render them universal favourites, and as they are among the earliest plants to blossom, they herald the advent of spring. They belong to the order of "pod-bearing" plants, and make up not far short of one-third of this by far the largest order in Australia. Though pod-bearing plants have over 1,000 representatives on this continent, yet only a d zen or so unimportant species are endemic in New Zealand.

Though many useful food plants, such as the pea, bean, clovers, etc., are included in this order, yet many of its representatives are very poisonous, and cause much mortality among sheep and cattle in newly-settled districts.

One of the most remarkable pods is that produced by the Queensland bean. These pods are of enormous size, and the large, handsome seeds which they contain are occasionally mounted with silver and manufactured into fancy match-boxes, etc.

Many beautiful flowers are included among the "pod-bearers." None are probably more so than Sturt's desert pea, whose silver-green foliage and large, bright, and strikingly-attractive blossoms (bright scarlet with jet-black centre) render it conspicuous. The waysides and scrub, too, are gay with an almost endless variety of the "butterfly-shaped" blossoms, which form a large division or sub-order. Several of these, in spite of their beauty, are reputedly poisonous to stock.

Next in importance, when the number of species is taken into account, are the proteads. So variable were the earliest-known species of these plants that they had the name of the ever-changing and puzzling sea-god bestowed on them by the great Linnæus. Six hundred species are indigenous to Australia, but only a couple, and these peculiar to the islands, are found naturally in New Zealand.

The banksias, or "honeysuckles," as they are popularly called, are probably the largest and commonest plants in this order. Their popular name, like so many others of colonial origin, is hardly a happy one, though it must be admitted that many of them produce a sweet secretion sought by wild bees and the aborigines, but which frequently causes nausea and headache in those Europeans who are bold enough to taste it. The strong, peculiar, and deeply-indented foliage of the banksias and allied dryandras is often a striking characteristic of their genera.

Even more striking and interesting still in this order are the grevilleas and hakeas, which are very closely related. They differ generally, however, in the position of the flowers and the character of the seed-vessel. Many of these two genera produce gorgeous blossoms in great profusion. A plant of this order, too, produces the "wooden pear," of which so much has been sometimes said. The flower which has often been regarded as the national blossom of Australia—the waratah—is included also among the proteads. It is a noble flower, and thoroughly deserves the distinction.

Scattered far and wide over the whole continent are the plants which are the Australian representatives of the daisy. Forest valleys and mountain glens, especially in the south-east part of the Commonwealth, produce in great abundance the native musk, with its large and silvery foliage and musklike odour. The handsome timber cut from its gnarled upper roots and stem rivals bird's-eye maple in appearance.

Beautiful everlastings or "immortelles" are as widely distributed throughout the continent as they are popular for their permanence.

Grasses and grasslike plants are fairly well represented. The "kangaroo grass" is a valuable fodder plant which resists drought well, and springs into vigorous growth immediately after rain. Vast areas in the interior are covered with a harsh kind of grass, popularly called "spinifex," which is worthless as fodder. The nomadic tribes of indolent natives burn it in patches at intervals, in order to secure the few animals and reptiles which it harbours. Many useful native grasses are unfortunately becoming scarce where the pastures are overstocked.

Enormous tracts are covered with the wiry-leaved "grass-tree," which is not a grass at all, but belongs to the lily order. These plants grow frequently on grass-tree plains, and sometimes among stunted timber. Their long flower-spikes, several feet in height, each surmounting its tuft of leaves, and backed up by stunted or misshapen eucalypts, make a scene peculiarly Australian. These grass-tree plains are gay in spring with flowers of brightest hues. Herbaceous and shrubby, creeping and climb-

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ing species intermingle and weave a pattern such as art, with all her triumphs, cannot reproduce.

Many beautiful flowers are included among the Australian lilies. Some attain a large size; others are minute, but none the less attractive and beautiful. The various grass-lilies cover the meadows with brilliant colours, while the fringe-lilies speedily arrest the attention of even the most casual and passing observer by their delicacy of colour and fairylike fringe.

She-oaks, named casuarinas from the fancied resemblance of their so-called leaves to the plumage of the cassowary, abound in many localities, and form a striking feature of many landscapes throughout the continent. The pendulous, articulated branchlets, with the points representing the rudimentary leaves of these trees, offer but little resistance to the wind or surface to the sun. As they contain a pleasant acid, these branchlets are relished by cattle, which browse them off in a horizontal plane as high as they can reach.

Stately palms rear their graceful and lofty plumes in various parts from Gippsland to the north, and explorers who have crossed the arid and inhospitable interior have come across spots where these majestic plants mark veritable oases.

The native cherry is often a shapely tree yielding a handsome timber. The fruit-stalks are fleshy, and this has given rise to the statement that in Australia the cherries bear their stones outside the fruit.

Gouty-trunked bottle-trees and allied species are represented in most of the states. Some of them produce richly-coloured blossoms. One shares with the "silky oak" (a grevillea) the name of "flame-tree," as its bright scarlet blossoms, produced in rich abundance, resemble flame when seen at a distance. At the time of its profuse flowering this tree sheds its leaves, and this renders the effect much more striking. The ordinary bottle-tree of Queensland has a pithy centre which has been utilised in time of drought as fodder, and on "tapping" the trunk a considerable quantity of liquid has occasionally been obtained by a thirsty wayfarer.

The mallow order has many representatives, even in the desert country, and includes several cotton plants and one baobab.

The "kangaroo apples" and other species represent the nightshades. When thoroughly ripe, some of these fruits may be eaten. They formed part of the food of the aborigines, but they are not generally palatable to Europeans owing to their acrid and pungent flavour. In the earlier stages they are often quite poisonous. The well-known narcotic properties of this order may be seen in the species yielding "pituri," which is chewed by the natives. Interesting experiments have recently been made regarding the effects of this drug.

Of plants belonging to the rue order there are a goodly number, including the native fuchsia and, from Western Australia, the exquisitely fragrant but sombre-looking boronia, and other brilliant but less odorous species of the genus. Geraniums make up for their lack of species by their wide distribution, being found in all the states.

Large, glossy-leaved fig-trees abound in some parts. Included in the same order are the nettles, one of which, the tree-nettle, is remarkable, because the irritation from its stings produces madness in the unfortunate animals which come in contact with them.

Euphorbias are widely distributed throughout the continent, and include the "asthma herb," and others of medicinal, or often of poisonous, characters. Graceful ferns reach their greatest perfection in the moist forest glens, and cover many thousands of acres with unsurpassed beauty, particularly in the south-east. Overhead, the tops of gigantic eucalypts form an interlaced canopy, and filter the rays of the scorching summer sun. Beneath their shelter the undergrowth forms another and a denser canopy, which shelters the stately palmlike fern-trees, whose graceful feathery fronds form again a grateful shade for humbler and more tender species. Every shade of green is here seen. The unfailing stream babbles musically below. Tender, filmy, and graceful climbing ferns grow with delicate mosses in richest variety and abundance on fern-tree trunk and prostrate forest giants. Mint-trees, laden with their beautiful blossoms, add a new aspect to the scene, which forms an ideal earthly paradise, and completely baffles description.

Queensland is the home of the greatest number of species, over forty-two per cent. of the whole flora being endemic to that state. As might be expected, too, tropical vegetation is there seen in its wild luxuriance.

Of mistletoes and allied plants we possess a number of varied and interesting forms. Epiphytal plants are also in some parts numerous, and include chiefly some ferns and orchids.

Heathlike plants are found in great luxuriance. They are the epacrids, which, with barely an exception, are confined to the southern hemisphere, while many of them are exclusively Australian.

Orchids include almost every conceivable colour. Their peculiar and often grotesque flowers, combined with their unrivalled beauty, render them conspicuous. They are well represented in our flora. In spring the southern meadows are bright and gay with the blossoms of numerous terrestrial species, while in the tropical regions of the continent they decorate the trunks and adorn the branches of even lofty trees.

Insectivorous plants are represented by many species of sundews, several pitcher-plants, and the bladderworts.

In food-plants Australia is not rich, but timbers and fibre-plants are well represented, especially the timbers.

Medicinal plants include the large genus eucalyptus, also the alstonias or fever-bark trees, the asthma herb, gentians, and others.

Altogether the Australian flora may be said to be not only unique in character, but deeply interesting and attractive.

THEORETICAL MECHANICS.

(ADVANCED AND HONOURS STAGES.)

BY FRANK CASTLE, M.I.M.E.,

Royal College of Science; Lecturer on Mechanics, etc., Morley College, London; Author of "Elementary Practical Physics," "Practical Mathematics," etc.

Laws of Motion.—It is necessary to be familiar with Newton's three laws of motion. As these may be obtained from any text-book on the subject, it is, with the exception of the second law, unnecessary to do more than refer to them here. The second law states *that change of motion is proportional to impressed force.* This law of paramount importance in dynamics is better stated in modern form as follows:—*The impulse of a force is measured by the momentum it produces.* The word momentum denotes the product of the mass and its velocity, and the impulse of a force, the product of the force, and the time during which it acts.

In symbols this becomes $Ft = Mv$ (i), where M is the mass of the body and v the velocity generated by the force F in a time t.

The choice of suitable units of measurement gives rise to three so-called systems. Thus in the C.G.S. system, mass is measured in grammes, v in centimetres per second, t in seconds, and F in dynes.

In the F.P.S. system mass is measured in pounds, velocity in feet per second, and force in poundals.

In the third system, known as gravitation measure, or engineers' units, forces are measured in pounds or tons, mass in pounds or tons, and velocity in feet per second.

Measurement of Force.—Eq. (i) may be written in the more general form, $Ft = M(v - v_1)$, ... (ii)
where v_1 denotes the initial and v the velocity at the end of a time t.

As acceleration is rate of change of velocity, we obtain at once (when t is unity), the fundamental equation of dynamics
$F = Ma$. . . . . (iii)

This equation is so important that it should be remembered not only in its symbolic form but also in words, as follows:—Force is measured by the product of mass and acceleration.

It will be noticed from (iii) that three terms are involved, any two of which will enable the remaining term to be obtained. Another equation in uniform acceleration involving the space described may be obtained from Eq. (iii). Thus space described is the product of average velocity and time. $\therefore s = \frac{1}{2}(v + v_1)t$. Multiplying this by Eq. (iii), we obtain $Fs = \frac{1}{2}M(v^2 - v_1^2)$. (iv)

When the body starts from rest, the initial velocity is zero, and (iv) becomes $Fs = \frac{1}{2}Mv^2$.

The preceding equations may be readily obtained by the most elementary applications of the calculus. Thus, with the usual notation, δt, δv, and δs, to denote small increments of time, velocity, and space respectively, we may write Eq. (i) in the form $F = M\frac{\delta v}{\delta t} = M\frac{\delta^2 s}{\delta t^2}$.

The work done by a force F through a space δs is $F\delta s$.

$$\therefore F\delta s = M\frac{\delta v}{\delta t}\delta s, \text{ but } \frac{\delta s}{\delta t} = v. \quad \therefore F\delta s = Mv\delta v.$$

This becomes in the limit $Fds = Mvdv$. Integrating $Fs = \frac{1}{2}Mv^2 + C$, where C is a constant of integration.

If, when $s = 0$, $v = 0$, then $C = 0$, and the preceding equation becomes $Fs = \frac{1}{2}Mv^2$.

If, when $s = 0$, $v = v_1$, then $C = -\frac{1}{2}Mv_1^2$.

$$\therefore Fs = \frac{1}{2}M(v^2 - v_1^2).$$

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If w is the weight of a body, then as $w = Mg$, Eq. (ii) may be written in the form—

$$Ft = \frac{w}{g}(v - v_1). \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (v)$$

And, similarly, Eq. (iv) may be written—

$$Fs = \frac{w}{2g}(v^2 - v_1^2) \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (vi)$$

(where g is the acceleration due to gravity).

Work done by a Force.—The preceding introduces the product of a force F and a distance s through which it acts. This is called the work done by the force, and may be either positive or negative—the former when the displacement of the point of application of the force in direction and sense is the same as that in which the force acts, and the latter when it acts in the opposite direction. It should be noticed that the product Fs is merely a special case of the work done by a force, in which, as already stated, the line of action or direction of a force is coincident with the direction of the displacement. The resolved part only of the force is effective when the direction of the force is inclined at an angle θ to the direction in which displacement occurs. Hence work done $= Fs \cos\theta$. The special case of this formula, when $\theta = 0°$, and therefore $\cos 0° = 1$, has already been referred to. Other special cases occur when $\theta = 90°$ and $\theta = 180°$; in the former, as $\cos 90° = 0$, the work done by the force is zero. This is the case of two smooth surfaces in contact, in which, as the mutual force or pressure between them is always perpendicular to the common tangent, no work is done by the force. The latter is a retarding force tending to decrease the motion of a body.

It will be obvious that as the weight of a body constitutes a force, Eq. (v) may be written $ws = \frac{wv^2}{2g}$.

This is frequently termed the equation of work or energy—the part on the left indicating the work stored up, or *potential energy of a body;* that on the right *the kinetic energy*, which may be generated or destroyed by it.

Ex. 1. Prove that if a train weighing w tons acquires a velocity of v feet per second in s feet, and t seconds from rest at one station by a propulsive force of P tons, and is brought to rest again at the next station in s' feet and t' seconds by a retarding force P′ tons—

(i) $Ps = \frac{wv^2}{2g} = P's'$. (ii) $Pt = \frac{wv}{g} = P't'$. (iii) $\frac{s + s'}{t + t'} = \frac{1}{2}v$.

(Inter. Sci., 1901.)

(i) and (ii) obviously follow at once from Eqs. (v) and (vi).

To obtain the relation expressed by (iii), we have—

$$Ps = \frac{wv^2}{2g}. \quad \therefore s = \frac{wv^2}{2gP}.$$

$$\text{Similarly, } s' = \frac{wv^2}{2gP'}.$$

$$\text{Hence } s + s' = \frac{wv^2}{2gP} + \frac{wv^2}{2gP'} = \frac{2gwv^2(P + P')}{4g^2PP'}. \quad (vii)$$

$$\text{Also from } Pt = \frac{wv}{g}, \text{ we obtain } t = \frac{wv}{gP}.$$

$$\text{Similarly, } t' = \frac{wv}{gP'}.$$

$$\therefore t + t' = \frac{wv}{gP} + \frac{wv}{gP'} = \frac{gwv(P + P')}{g^2PP'}. \quad . \quad (viii)$$

Dividing (vii) by (viii), we obtain—

$$\frac{s + s'}{t + t'} = \frac{2gwv^2(P + P')}{4g^2PP'} \times \frac{g^2PP'}{gwv(P + P')} = \frac{1}{2}v.$$

Ex. 2. (*a*) Write down the formulæ required in rectilinear motion with constant acceleration. (*b*) Prove that if a body starts from rest, acquires a maximum velocity V with constant acceleration, and then comes to rest again with constant retardation all in a distance s, the time occupied is $s \div \frac{1}{2}V$. (Inter. Sci., 1901.)

(*b*) If F denote the force, s the space, and t the time, M denoting the mass of the body, then

$$Fs = \tfrac{1}{2}MV^2 \text{ and } Ft = MV.$$

Dividing one equation by the other, we obtain—

$$\frac{Fs}{Ft} = \frac{MV^2}{2MV}. \quad \therefore \frac{s}{t} = \frac{V}{2}. \quad \text{Hence } t = s \div \tfrac{1}{2}V.$$

Ex. 3. Formulate the equations of impulse and momentum. A bullet weighing $\frac{1}{2}$ oz., and moving with a velocity of 1,550 feet per second, strikes a target, and penetrates during 0·002 second. Find the mean resistance of the material and the depth of penetration. (B.A., 1900.)

$$\text{Here } \tfrac{1}{2} \text{ oz.} = \frac{1}{32} \text{ lbs.} \quad \therefore \text{mass} = \frac{1}{32 \times 32} \text{ (taking } g = 32).$$

$$\text{Let F denote the force— } F \times 0{\cdot}002 = \frac{1550}{32 \times 32}.$$

$$\therefore F = \frac{1550}{32 \times 32 \times {\cdot}002} = 757 \text{ lbs.}$$

To find depth of penetration, we use the equation—

$Fs = \frac{1}{2}MV^2$, where F = 757, M = 1 ÷ (32)², and V = 1550.

$$\therefore s = \frac{(1550)^2}{2 \times (32)^2 \times 757} = 1{\cdot}55 \text{ feet.}$$

Ex. 4. Investigate the formula $s = ut + \frac{1}{2}ft^2$.

A weight of w tons is moved from rest by a force of P tons till its velocity is v. It is then brought to rest by a force of Q tons, and altogether has passed through a feet in t seconds.

Prove (i) that $t^2 = \frac{2aw}{g}\left(\frac{1}{P} + \frac{1}{Q}\right)$;

(ii) that its kinetic energy, when its velocity is v, is $PQa \div (P + Q)$. (1903.)

Ex. 5. A shot weighing 1,300 lbs., and moving at 1,730 feet per second, strikes a fixed target. How far will the shot penetrate if the average resistance to penetration be 13,500 tons weight? Ans. 2·005 feet. (1902.)

Ex. 6. State Newton's first law of motion, and give three illustrations of it.

A ball is put into a box which it fits loosely, and the box moves with a uniform rectilineal velocity. Explain whether there will be any action between the ball and the sides of the box. After a time the velocity of the box is accelerated. Explain how your previous answer will be affected. (1902.)

Ex. 7. Prove that if m grammes acquire a velocity v cm. per second from rest in t seconds while describing s cm., the accelerating force is $mv \div t$, or $\frac{1}{2}mv^2 \div s$.

Ex. 8. Prove that the shortest time, from rest to rest, in which a chain which can bear a steady load of P tons can lift or lower a weight of w tons through a vertical distance h feet is given by $\sqrt{\left(\frac{2h}{g} \cdot \frac{P}{P - w}\right)}$ lbs. (Inter. Sci., 1902.)

Ex. 9. If a burning candle be placed vertically in still water, and v be the velocity with which its length burns away, show that the wick descends towards the surface of the water with a velocity $(1 - \rho)v$, where ρ is the specific gravity of the candle. (1903.)

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BY EDWIN EDSER, A.R.C.S., F.PH.S.

The Electric Glow Lamp (*continued*).—The electric glow lamp, though it possesses many advantages over luminous flames, is by no means an efficient light producer. A little consideration will show the reason of this. The efficiency of a light producer increases as the temperature rises, and therefore a high temperature is necessary for a high efficiency. Now the temperature of the filament of a glow lamp is subject to various limitations. In the first case, it must not rise so high as the melting point of platinum, or the connecting wires will be fused. In the second case, carbon, when sufficiently heated *in vacuo*, commences to sublimate—that is, to be converted into vapour without passing through the liquid stage. This process goes on, to a certain extent, in all glow lamps. It is the cause of the blackening of the bulb, which can nearly always be noticed in lamps that have been run for a long time. Although the filament of a glow lamp cannot be liquified by heat, it is generally rendered soft when glowing; for this reason the filament vibrates readily when cold, but cannot do so when glowing. Its properties, which resembled steel when cold, approximate to those of lead when heated. In this connection it is interesting to remember that Dewar has found that lead becomes as elastic as steel when cooled to the temperature of liquid air. As a consequence, therefore, of the physical properties of carbon, the filament cannot be raised to a very high temperature, with the consequence that the maximum efficiency corresponds to the consumption of about two watts for each candle power produced. Commercial lamps are never rated at an efficiency so high as the above, since that corresponds to the very highest temperature to which the filament could be subjected without destruction. If run at this high temperature, a slight rise in the voltage of the supply system would destroy the lamp, either by melting the platinum connecting wires or by quickly disintegrating the filament. Generally speaking, an electric glow lamp requires about four watts for each candle power produced.

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system will be economical in proportion as the voltage of supply is high; therefore every effort has been made in recent years to produce a lamp of as high voltage as possible. In the case of a sixteen candle-power lamp, sixty-four watts will be required; and since the watts are equal to the square of the volts divided by the resistance, it follows that the resistance of such a lamp will be equal to $\frac{(200)^2}{64} = 625$ ohms. To obtain this high resistance, the filament must be made either very long or of very small sectional area. It would be impossible to enclose a filament of very great length in a lamp of convenient size, and thus makers have been driven to use very fine filaments. The limits in this direction are imposed by the liability of the filament to be broken by accidental vibrations when its sectional area is less than a certain value.

If some substance much more refractory than carbon could be utilised in the production of conducting filaments, a much more efficient glow lamp could be produced; but so far all attempts to attain this end have proved fruitless.

The Arc Lamp.—When two carbon rods connected to the terminals of a supply system are momently brought into contact and then separated, a faintly luminous arc is seen to join the near carbon points, and this arc constitutes a conducting bridge between them. Of course, metallic rods could be used instead of the carbon, but the latter substance is preferable on account of its high volatilising point. After the arc has been formed for some time, the adjacent ends of the carbon rods are seen to become luminous, though to different extents. The end of the positive carbon—that is, the carbon attached to the positive main, and therefore the one which the current leaves in order to form the arc—becomes hottest, and soon assumes a crater-like form (see Fig.), while the end of the negative carbon becomes more or less pointed. The interior of the positive crater reaches the highest temperature, and therefore glows most brightly. It is generally considered that the carbon there reaches its boiling point. On account of the high temperature of the positive crater, the efficiency with which light is produced is very high. It requires only about 0·8 watts for each candle power produced. Arc lamps are of little service for indoor illumination, since they generally emit about 1,000 candle power; but for outdoor illumination or for lighting large halls, their high efficiency renders them extremely economical and satisfactory. Since arc lamps are generally hung high up, the positive carbon is generally placed uppermost; in this way the light from the glowing crater is thrown downwards. Part of this light, however, is intercepted by the lower carbon and its holder. The positive carbon "burns away" much more quickly than the negative carbon. To prevent unequal shortening of the carbons, the positive is generally made thicker than the negative carbon. In alternating current circuits, the current surges backwards and forwards, so that there is no positive carbon; or, speaking more strictly, each carbon is positive for a short space of time, and then becomes negative. An alternating arc can always be distinguished from a continuous arc by the humming noise produced by the former. This is due to the fact that the gases of the arc become partially cooled while the current is changing from one direction to the other, and subsequently increase in temperature as the current rises in its new direction. Without this aid, however, we could still distinguish the light from an alternating arc from that produced by a continuous arc. If a white object, such as a strip of paper or a handkerchief, is quickly waved in the neighbourhood of an alternating arc lamp, it is rendered visible each time a temporary positive crater is formed, and disappears as the current falls to zero just before changing its direction. Thus the object is seen, in a short interval of time, in a number of different positions; and as a sensation of light endures for about a tenth of a second, it follows that the white object appears as ten or a dozen distinct objects.

THE ELECTRIC ARC.

An alternating arc is less efficient as a light producer than a continuous arc. This is partly due to the circumstance that with the alternating arc both the upper and lower carbons are luminous, and therefore half the light is thrown upwards and the other half downwards, instead of all being thrown in one direction, as in the continuous arc. Further, when each carbon is heated for a short interval of time, and then allowed to cool, neither reaches so high a temperature as that attained by the positive crater in a continuous current arc lamp. An alternating arc requires about 1·5 watts per candle power produced.

The difference of potential necessary to produce an arc between carbons is found to depend on the length of the arc, and also on the current employed. Mrs. Ayrton has found that the potential difference, V, in volts between the carbons may be expressed by the formula—

$$V = \alpha + \beta l + \frac{\gamma + \delta l}{C} \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

Where α, β, γ, and δ are constants, l is the length of the arc in millimetres, and C is the current in amperes. The values of the constants are as follows:—

$$\alpha = 38{\cdot}9. \qquad \beta = 2{\cdot}07. \qquad \gamma = 11{\cdot}7. \qquad \delta = 10{\cdot}5.$$

Problem.—Calculate the P.D. corresponding to an arc of four mm. length when the current is equal to ten amperes.

$$V = 38{\cdot}9 + (2{\cdot}07 \times 4) + \frac{11{\cdot}7 + (10{\cdot}5 \times 4)}{10} = 50{\cdot}6 \text{ volts.}$$

The formula (1) shows that with a given current the voltage of the arc increases with the length of the latter. If, on the other hand, we determine the voltage of an arc of constant length when the current is varied, it at once becomes apparent that *the voltage decreases as the current increases.* This is due to the circumstance that the first two terms on the right of (3) are independent of C, while the third term (which is positive) contains C in the denominator, and therefore diminishes as C increases. Thus the electric arc does not obey Ohm's law. This is not surprising, since an increase of current must enhance the temperature of the gases in the arc, and the conditions necessary for the fulfilment of Ohm's law are absent.

The circumstance that the P.D. of the electric arc diminishes as the current increases necessitates special precautions in the design of arc lamps, to avoid instability of the arc. For let us suppose that, owing to the switching on of extra lamps or any similar cause, the impressed voltage between the terminals of a lamp is momentarily diminished. The back pressure of the arc for the instant remains constant, and is therefore greater than the impressed voltage; consequently the current diminishes, and this further increases the back voltage of the arc, so that, in short, the current ceases to flow, and the arc is broken.

To avoid this a metallic resistance coil (called a ballasting resistance) is arranged in series with the arc. An increase in the current produces an increased drop of potential in this coil, and this compensates for the diminution in the back voltage of the arc. In these circumstances the arc becomes stable.

When arc lamps are coupled up in series, a series-wound dynamo, arranged to give a constant current, is employed. Each lamp is provided with a mechanism which allows the carbons to touch when no current is flowing, but pulls them apart so soon as the current starts. In its simplest form this mechanism may consist of a long solenoid, connected in series with the carbons, and surrounding a rod of soft iron. This arrangement is mounted near the top of the arc lamp, with the axis of the solenoid vertical, and the upper (positive) carbon is fastened to the lower end of the iron rod. When no current is flowing, the upper carbon falls under the weight of itself and the iron rod, and makes contact with the lower carbon. On turning on the starting-switch, the current begins to flow. Almost immediately, however, the iron rod is sucked up into the solenoid, so that the carbons are separated and the arc is formed. An additional arrangement must also be supplied to maintain those arcs which are in series with each other equal in lengths, for otherwise the longer arcs would take more watts and be brighter than the shorter arcs. This result is accomplished by providing the series solenoid with a second winding, connected in parallel with the arc. The winding is so arranged that its current circulates in a direction opposite to that of the series winding of the solenoid, while the magnetic field it produces may weaken, but cannot reverse, the field of the series winding. Since this parallel winding is connected, one end to each carbon, and its resistance remains constant, the current flowing through it will be directly proportional to the difference of potential of the carbons; consequently, if one of the arcs becomes too long, the P.D. between the carbons increases. This augments the current in the parallel winding, and so diminishes the field which sucks up the iron rod supporting the upper carbon, with the result that the latter falls, and the arc regains its normal length.

When arc lamps are run in parallel from constant pressure mains, the parallel winding of the solenoid may be dispensed with, since in this case the arc cannot attain a length greater than that corresponding to the P.D. between the mains diminished by the drop of potential in the ballasting resistance.

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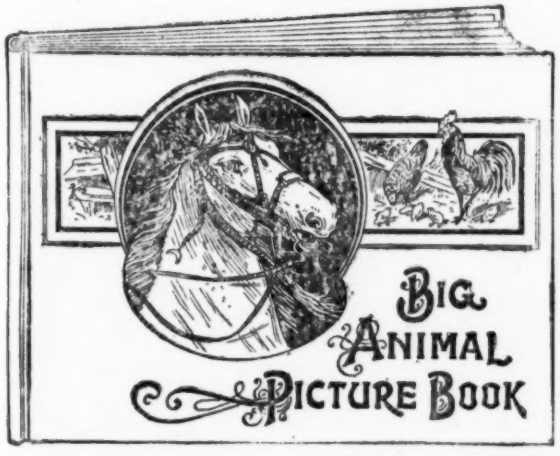

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of the bacterial methods described—namely, the bacterial filter, or the bacterial tank, or a combination of the two. This chapter leads to the fourth section, the hygiene of the nation as a whole, with chapters on preventable diseases and the preventive measures which ought to be exercised, on school hygiene, and on health in the workshop, which includes unhealthy occupations and dust diseases. In the fifth and sixth parts, the subjects of demography, or vital statistics, and meteorology are discussed. The former is interesting, since we find many exposures of the fallacies which underlie some of the deductions consequent on the employment of defective data. In the section on meteorology, the instruments are first described; methods for determining the velocity of the wind and its pressure; the determination of humidity and rainfall. A useful appendix gives us the metrical and British weights and measures, the results of the census of 1891, and analytical tables of the composition of foods. The summary at the end of each chapter and the sets of examination questions furnished on each are very useful, and manifestly increase the suitability of the volume.

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